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Personal Computing

FEBRUARY 1979

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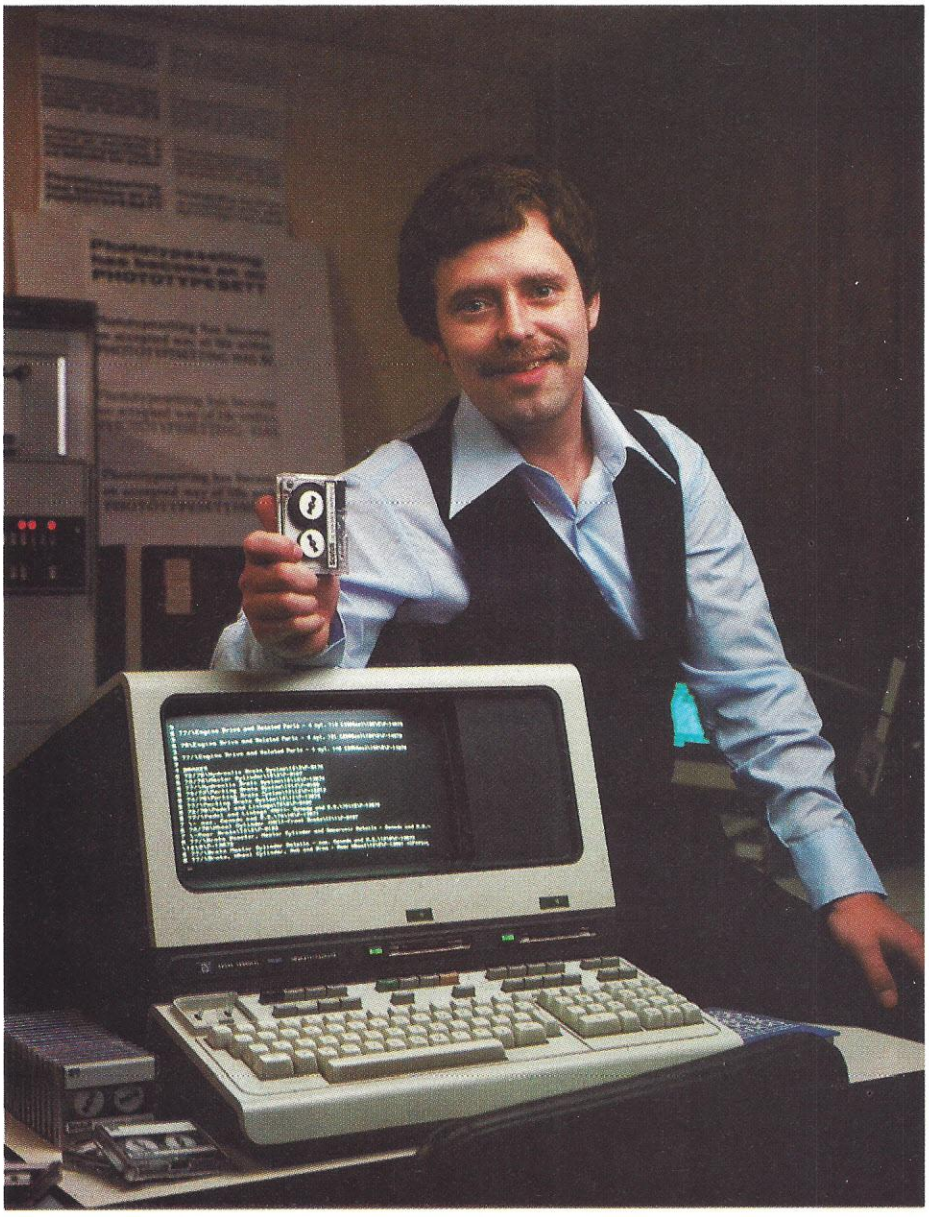

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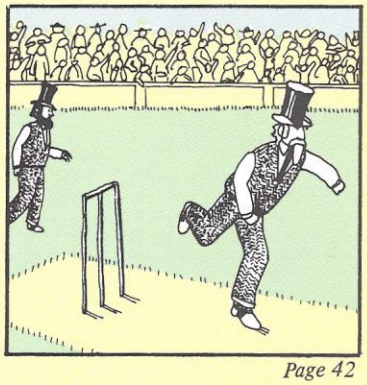
CIRCLE 1

Personal Computing

FEBRUARY 1979 VOL. III NO. 2
Publication Number USPS 370-770

Page 46

Page 14



Page 42

Cover photograph
by Jon Buchbinder
Place setting compliments
of Design Research, Inc.
Cambridge, MA

DEPARTMENTS

COVER STORY

LAUNCHING PAD

DIGGING IN

ON THE LIGHTER SIDE

Personal Computing

FEBRUARY 1979 Vol. III, No. 2

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FEEDBACK

Pope Paul John Paul I

Dear Editor:

Pope John Paul I's choice of a name formed by combining the names of his two predecessors (Pope John XXII and Pope Paul VI) raises an interesting question: if successive popes also follow this practice, what will their names be? For example, the successor of Pope John Paul I would have been called Pope Paul John Paul I, and his successor in turn would be named Pope John Paul Paul John Paul I. To carry this out further, the language PASCAL provides a simple way to generate the name of the nth pope (counting Pope John XXII as the first in this sequence) via the following recursive procedure:

```
procedure pope (n: integer);
begin
    IF n = 1 THEN write ('John')
             ELSE IF n = 2 THEN
             write ('Paul')
             ELSE BEGIN
                  pope (n-2):
                  pope (n-1)
                  END
end;
```

It may also be computed, based upon the facts that the average papal reign is seven years and that the words "John" and "Paul" each require half a second to say, that by the year 2280 the name of the new pope will take longer to announce than the pope will probably live. Fortunately, the current pope has decided to adopt the name John Paul II, which at least mathematically is a wise choice.

Jeff Levinsky
Berkeley, CA

Bessie Remembered

Sir:

A former IBMer (circa mid-1950s), I was fascinated by "I Remember Bessie" in your May/June 1977 issue.

I think the author has made one mistake. Or else my memory is getting cobwebby. He says that the 650 preceded the 701 and 702.

If I am not mistaken, the 701 was produced in a very limited quantity for scientific applications. Then along came the 702 for industrial applications – I believe Monsanto was the first company to receive one.

Then just about the time that the 704 and 705 became available – one for scientific applications, one for industrial applications – IBM introduced the 650 as the first medium-sized electronic computer. It was a very popular machine in its day – and played quite a role in providing IBM with the edge it never subsequently lost. Up until then, Rem Rand was pushing very aggresively with its Univac.

Ellison Smith
West Lafayette, IN

Author's note: I am inclined to think that Mr. Smith's memory is approximately as cobwebby as mine; better let IBM arbitrate as to which is how much right or wrong. ("Cobwebby" is a wonderful word! Thank-you, Mr. Smith, for adding it to my vocabulary.)

My evidence for the 650 being first is largely circumstantial or hearsay. When IL (Instrumentation Laboratory) got the 650, it was displayed proudly in the main lobby of MIT, 77 Massachusetts Ave., for a week before it was installed in IL. I doubt if this would have been done if it were a second string machine.

While I was not at the forefront of computers, I was close on the sidelines and taking note of everything I heard. I did not hear of the IBM 700 series until several months or a year after we got our 650; then, as nearly as I can remember, I heard of the 702 and the 705. I remember that one was decimal and one was binary (don't ask me which was which) and that General Electric at Lynn, to everybody's surprise, was getting the binary machine even though their application was business: payrolls and the like. I suspect that this was so that manipulating the bits of one control word could control the whole set of payroll deductions. For instance, bits 1, 2, 3 could control 1 to 7 tax exemptions; bit 4, pension deduction; bit 5, community chest contribution, and so forth.

Also, various features of the 650 were carryovers from punched card machines: format control by a plugboard rather than software; output punched cards that had to be taken to an off-line printer. I was never close to any of the 700s, but I rather thought their format control was by program; their memory, core; their decimal arithmetic, BCD; output printed on line. The 650 had drum memory (I think before core was available).

I remember, too, reading that the New York Central RR had four 650s, two of them in the same room at Cleveland. If a bigger machine was available, you'd think they would have picked it. An electric power company used the 650 to compute bills and included a total of each rate class. But because of the limitations of 2000 words of memory, for the less frequent rate classes they punched out cards to be totalled later; here again, if a bigger machine had been available, you'd think they'd get it.

I only heard vaguely of the Univac and rather confused it with the Eniac; not until years later did I realize it was a commercially produced machine. Perhaps Univac stood in my mind with Aiken's Mark II, Mark III, Mark IV: newer developments but still one of a kind. *–Henry Brainerd*

Index Statement

Editor's note: Recently, a reader inquired about the INDEX Statement in Rodger Pogue's "Music in Your Memory" article (July *PC*). He discovered, while trying to implement the program, that his BASIC did not have the INDEX command used in various lines of Mr. Pogue's program. We asked Mr. Pogue to help out with this problem.

– M.M.

Author's Note: First, let me say that the INDEX statement is used for searching a particular string (such as A$(J)) for the first occurance of another string (such as H$, which equals "/") and then returns the value of the first position in A$(J) where H$ occurs. A very simple patch for my program is as follows:

```
X464 N1=24
X465 IF MID$(A$(J),N1,1)<>H$
     THEN N1=N1+1:GOTO X465
X466 N1=N1-23
X474 O1=N1
X475 IF MID$(A$(J),
     24+O1,1)<>H$
     THENO1=O1+1: GOTO X475
X476 O1=O1-(N1-1)
```

This patch should work. However, when I tested it the program took between three to six seconds longer per album to print out the results on my system. I hope this will be of assistance to your readers.

– Rodger Pogue

Candy is Dandy

Editor:

Your December issue (Random Access) had an item about a British Micro-Sub called SMARTIE. You might care to know that the naming of this water vehicle was the result of a delightful tidbit of British deduction. When the sub was plopped into the water for the first time, someone noticed that the shape and color of the device bore a remarkable resemblance to a popular British candy, brand-named SMARTIES. This candy is exactly like the American M & M and differs from its Yankee cousin by not wearing a monogram on its outer coat of colored glaze. The sub, nameless up to that point in its development, was therefore officially labeled SMARTIE and the shop painter was quickly summoned to put a name in the proper place. Now, having invented a designation for the device but fearing the wrath of British taxpayers who might resent the sight of bits of "candy" bobbing in the Thames, the inspired engineers resorted to the use of a reverse acronym: Sub-Marine Automatic Remote Television Inspection Equipment. Very clevah, these British!

A.L. Tritter
Yorktown Heights, NY

Help Needed

Dear Editor:

Could you or any of your readers help? I have just purchased an ATARI Video Computer System games unit and would like to modify it for use as a personal computer. Any help sent will be gratefully received. I'll also pay any expense incurred.

G. Bramwell
Philips Service
12 Stocks St.
Manchester 8 Ms 8QG
Lancaster, England

Dear Editors:

I am writing to obtain information on the Atari Video Computer System. I enjoy the machine very much and would like to know if there will be any additions to it – add ons, game programs, and so forth. Does any company plan to make a machine to use in connection with the Atari to up-grade the game machine into a computer? Any information you can give me will be of great help.

John C. Sisku, Jr.
Huntington Beach, CT

Editor's note: Because of the interest shown by our readers in the Atari system, we contacted Atari, Inc. Peter N. Rosenthal, Manager of Software Planing, said the company is "actively pursuing the development of a Game Program that will allow Video Computer System owners to develop programs in BASIC. This cartridge will allow users to write entertaining programs of their own design and it will give users a point of comparison in evaluating their own needs with regard to more flexible personal computers such as the Atari-400 and the Atari-800 personal computer systems. You can be assured that Atari will continue to develop a wide variety of new and exciting Game Programs for the Video Computer System."

– H.S.

Puzzler Resolution Resolved

Gentlemen:

I enjoyed your "Dazzler Graphics" article in the September issue. What did Ms. Schreiber use for a CRT? I just installed a Vamp Inc. direct video interface in a 12" Panasonic CT/V and got very poor resolution of my Sol 20 64 character line. Presumably this is because of CT/V bandwidth limitations.

Frank J. Gizinski
Racine, WI

Author's note: The Dazzler outputs to a Heathkit television set which contains an RCA black matrix picture tube. Poor resolution on your CRT may be corrected with one of the following suggestions:

The convergence on your CRT may be out of alignment. This would be noticed more readily with the Dazzler than with normal viewing. Or, you could try to manually degauss the picture screen. Some sets have such a feature in addition to the automatic degaussing. Finally, you could try a direct hook-up from the Dazzler to the CRT. This would involve bypassing the tuner and i-f assembly and inputing into the video portion of the set. This is how the Dazzler is interfaced with our set. It does provide for the clearest display. *– Linda M. Schreiber*

Send your letters and Comments to Editor, Personal Computing *Magazine, 1050 Commonwealth Ave., Boston, MA 02215.*

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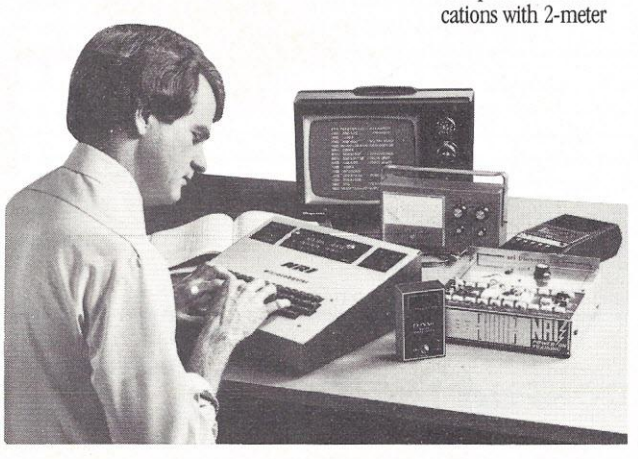

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CIRCLE 5

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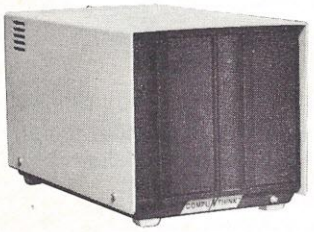

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CIRCLE 6

RANDOM ACCESS

Timely News

Los Angeles Times reporters can now incorporate late breaking developments into their stories and the production department can still meet publication deadlines, thanks to a computerized typesetting system which significantly cuts production time.

Previously an operator, typesetting manually on a Linotype machine, was responsible for designating column width, hyphenation and line justification, according to an LA Times administrator. Display ads had to be cut and laid out by hand.

In 1974 the Times began using a computerized photocomposition technique for typesetting to replace these long and tedious procedures. The typesetting system relies on an IBM 370/158 mainframe computer. Peripheral equipment includes three Autologic APS-4-100 typesetters, two APS-18 communications controllers, two Evans and Sutherland digitizing systems, as well as seven T8000 tape transports and six D3000 disk drives manufactured by Pertec Computer Corp.

Approximately 100 video display terminals are located throughout different departments of the paper for text input. The operator enters the text into the VDT with coded directions for typesetting. The IBM 370/158 takes care of line justification and hyphenation and a line printer produces a copy for proofreading.

After editorial approval, the text is sent via a direct line from the mainframe computer to the APS-18 communications controller where it is received by the Pertec disk drive. Finally, the APS-18 deposits the text into the typesetter and the typesetting process goes on. The photocomposed copy of the article is then sent through the remainder of the printing procedure.

The typesetting process for display ads varies slightly from the process for articles. It's based on a digitizing system which allows the ad text to be put on a video display board where an operator manipulates the typeface and line lengths and makes any changes or additions. When finished, the ad is entered into the typesetting cycle in the same manner as an article. Ad layouts are no longer done by hand.

For a back-up system the Times uses a magnetic-tape-based system. The operator inputs the story onto magnetic tape, which is transferred to the Pertec tape transport on the APS-4-100 to be typeset.

It takes an average of four minutes to run one page of the Times classified section through the entire typesetting procedure, said administrators. The stock page takes two and a half minutes, while typesetting itself takes only seconds.

Computerized ticketing machines for airline passengers are shown on the assembly line at Cubic Corporation, San Diego. These machines, manufactured for Pacific Southwest Airlines, enable passengers using any one of six credit cards to push two buttons and receive a one-way or round-trip ticket in 15 seconds. About 30 of the units are being installed in the 13 California airports served by the air carrier.

Banking on Calculators

A Georgia Bank has placed personal computer power into the hands of nearly every one of its employees from the president to his secretary.

Six months ago, the First National Bank of Dalton began purchasing HP Model 97 programmable calculators as a test of their effectiveness at streamlining the bank's operations. The bank now has twenty, sitting on the desks of the president, vice-presidents, officers and executive secretaries.

The HP-97s are used for most of the bank's non-teller activities, including computing installment loans and single payment (commercial) loans in terms of annual percentage rate and payments or

credit life; unequal schedule (balloon) payments; compound certificates of deposit to maturity or any specified date; and interest penalties.

Before purchasing the HP-97s, the bank had a single desktop calculator in the middle of the lobby. Each officer had to get up and walk over to use it, often after standing in line. Branch offices had to call in on the phone with every installment or single payment loan (about 2000 per month). Time and accuracy were lost.

Now, each officer has a calculator, including those in the branch offices, and a collection of magnetic cards for the HP-97 that include all of the programs they need. Two of the bank's executives developed almost all of the bank's programs. They duplicated them on the machine's magnetic programming cards and distributed them to employees.

Computer helps manufacturing plant

Imagine a million-dollar-plus product formula stuffed inside an employee's back pocket.

Or product engineering specifications tucked away in an engineer's brain — but not on paper.

Large companies today, which offer modern, comprehensive benefit plans, sometimes find that their employees stay on and on. And that's good, unless a loyal employee knows his job by heart and nobody ever writes it down. This situation can create an unsuspected slowdown in a manufacturing plant. It can cause havoc when employee turnover does occur.

Computerization can make a precision-minded manufacturing operation look closely at how — and where — its records are kept.

Such was the case with the Cleveland plant of the Carbon Products Division of Union Carbide Corporation, which has started using a Honeywell manufacturing information system.

The new system will contain product formula and monitor inventory. It should save the plant time and money. While the system is not in full operation yet, the developers say they have straightened out some kinks in the operation just by gearing up for it.

During the 1974-75 construction boom, the Cleveland plant's lead time on products went from six to 18 months. Promises made in good faith could not be met. While business continued to come in, customers were dissatisfied and said so. Plant management realized that it had to get better control of the inventory.

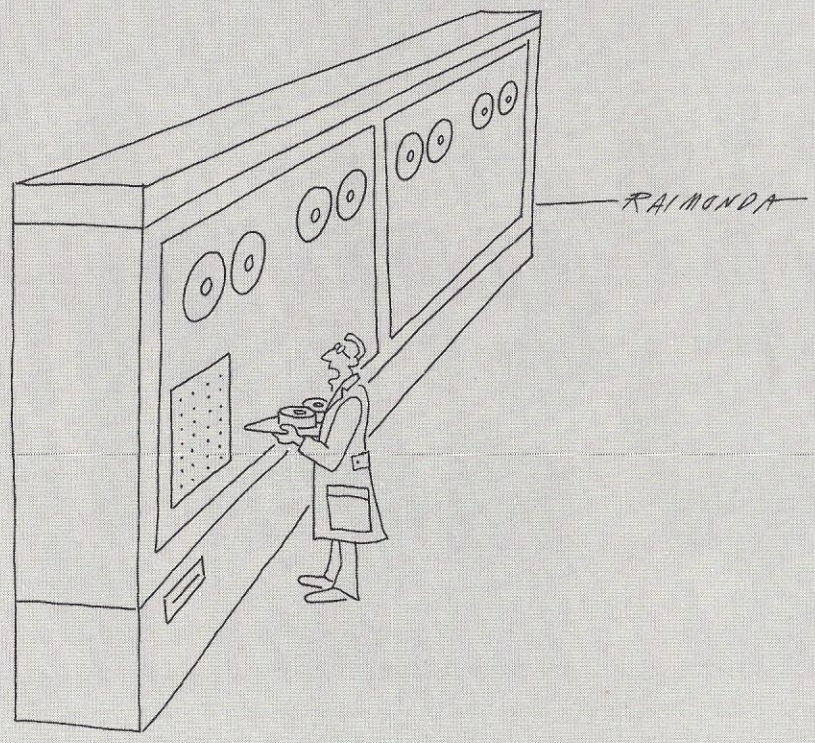
Some of the executives at Carbon Products had noticed the wands used at cash registers in some retail stores, which automatically remove a customer's purchase from inventory lists. Why couldn't they do something like that?

Carbon Products' Level 62 Honeywell computer, installed in May 1977, has 128K of MOS main memory and is equipped with two disk drives, a console printer and a card reader. There are currently two CRTs and the plant plans to link several more CRTs to the CPU.

Gearing up for the discipline of computerization took Carbon Products' implementation team into a step-by-step efficiency planning program.

"We discovered that while we had engineering bills of material, they were not satisfactory as manufacturing bills of material," said Robert Stamm, head of the computerization process.

"In the past, every time we did an order, we had to go back, step-by-step, to get the parts. A lot of the information was kept mentally. We had old-timers who, over the years, had just developed a knowledge of what was needed. In today's work force, it's necessary to have product specifications committed to paper. It



"Well, What'll it be today? Yellow tape or pink tape?"

can't be in somebody's back pocket."

So, the manufacturing division implementation team has, in Stamm's words, been "straightening up our own back yard."

Employees have attended many computer education classes. Meanwhile bills of materials have been fed into the system. The main difficulty has been in increasing inventory accuracy.

The team is now testing the system on a small product line and reports that the equipment is working smoothly.

"We're a job shop environment," Stamm said. "And there are large costs associated with our work. We have a heavy steel fabrication business. A large quantity of our parts are purchased from outside vendors. We put them together, do modification on them."

Within the plant, there are 15,000 material item records, 30,000 product structure relationships, 500 work centers and 10,000 routing records (combinations of manufacturing instruction). The plant processes about 1200 orders per month.

"We'll go to the computer and get the complete list of materials needed for an order. It will tell us when to promise delivery," Stamm said. "And also, which parts are in stock, which to make or order. It should allow us to maximize use of our capital by controlling our inventory. When you have millions in inventory, you don't buy a computer just to have it around."

The system will aid purchasing, sales forecasting, capacity planning and shop floor control.

A Success Story: Computer Photography

Technology has inspired development of several small businesses, but few of those can match the business — and success — of a little known enterprise generated by NASA when it transmitted the first pictures of the moon to the earth.

That breakthrough, which enabled the world to see close-ups of the moon for the first time, was a computer photograph. Since then, computer photography has become one of the fastest growing small businesses in the country.

In computer photography, a TV camera takes your image (the image can be live or on a photograph), freezes it and quickly prints it out (55 seconds) on computer paper. This same system was used in the space program to transmit TV images from the moon to earth via computer.

Computer photographs are sold primarily at fairs, malls and shopping centers where the business has become a big traffic builder and moneymaker. One of the companies in this business is Computer Amusement Systems Inc. (CASI) of New York.

CASI's founder, Sam Kendes, first saw the potential of computer photographs more than two years ago. Kendes was captivated by a computer photograph machine and the crowds it attracted in New York's Times Square in early 1977. The more he investigated the budding young business, the more intrigued he became. Within a few months, he founded CASI.

According to the company, CASI's photographs have generated the following:

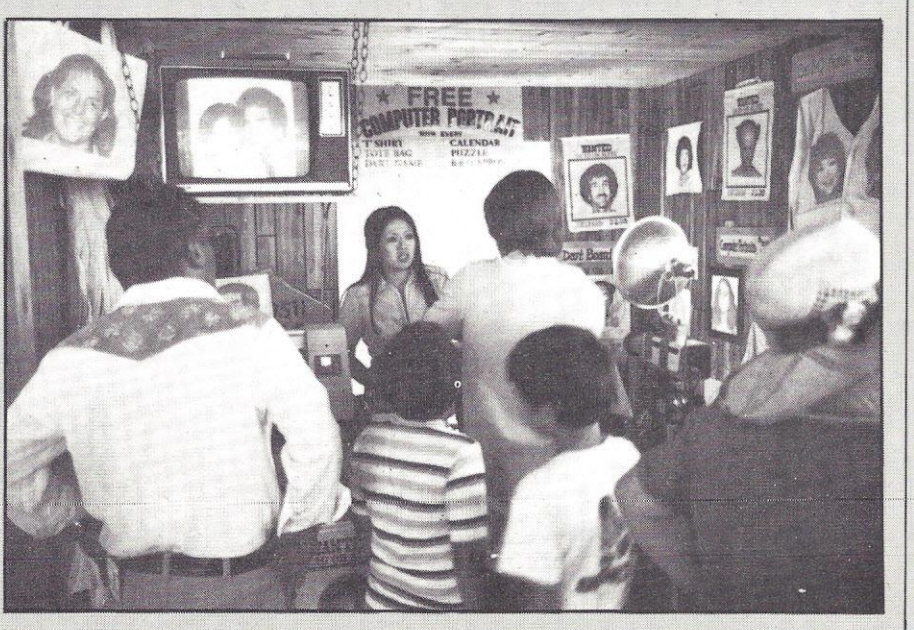
— $640 in sales in less than two hours at an amusement park in Los Angeles.

— $3000 in sales in less than 10 10 days at a department store in an Illinois suburb.

— $5000 a week for 38 weeks at a tourist attraction in southern California.

The CASI unit, which ranges in price from $7900 to $12,500, produces a picture that costs 10 ¢ and is sold for anywhere from $2.50 to $4. It can be transferred to T-shirts, handbags, calendars and even dartboards. The computer photo has attracted everyone from kids who want their favorite rock star's photo on a T-shirt to mothers who want a picture of their kids on a canvas handbag, calendar or T-shirt.

What makes the photo so appealing? Theorizes Kendes, "It combines three elements in society today — instant pictures (the Polaroid concept), television (which shoots the picture) and computers.



Show Notes

Here's some information on four upcoming computer shows.

The 1979 National Small Computer Show will run in the New York Coliseum August 24 through 26. The four day format, increased from the 1978 show, will have a lecture series broadened to cover more applications for micro and minicomputer users in personal and business categories.

The show's title was changed from the 1978 version — Personal and Business Small Computer Show — to more aptly describe the event's character, according to show manager Ralph Ianuzzi.

The Northwest Computer Society is sponsoring a Computer Fair March 10 and 11 at the Pacific Science Center in Seattle. The fair will include exhibits for the non-computer public, technical presentations for serious fans, and possibly an area for suppliers. Fee is the regular Science Center admission price. For more information contact Mike Holley, 16202-121st Ave. NE, Bothell, WA 98011.

The Northeast Computer Show of Boston will be held September 28 to 30 in the Hynes Auditorium. The show will feature microcomputers, small computer systems, computer-business opportunities, electronic and video games, career opportunities and seminars and lectures.

The show, a presentation for the trade and public, will bring together the small computer industry and its customers, including business people, hobbyists, doctors, scientists, engineers, accountants, homeowners, researchers, programmers, technicians, students and educators.

Prizes will be awarded to winners of a computerized mouse-maze contest, programming contests and other calculator and computer matches. Exhibitors will display and demonstrate computerized music synthesizers, amusements, art, graphics and animation. Lectures and seminars will be given for all categories and levels of enthusiasts.

Computer clubs and organizations, including high school and college clubs are encouraged to participate in the show. Special exhibits for children are also planned. For more information contact Show Manager, Northeast Personal & Business Computer Show, P.O. Box 678, Brookline Village, MA 02147; (617) 522-4467.

Midwestern Computer Expo will be held March 27 to 29 in Chicago at the McCormick Place on the Lake. The conference portion of Expo will be called the EDP Trend Briefing Sessions. Vendors, users and consultants will discuss data processing issues. All sessions will be open to Expo attendees. A series of OEM Buyers Briefing Sessions will be held for executives and engineers. For more information contact The Caravan Group, 60 Austin Street, Newton, MA.

Decision Making Made Easy

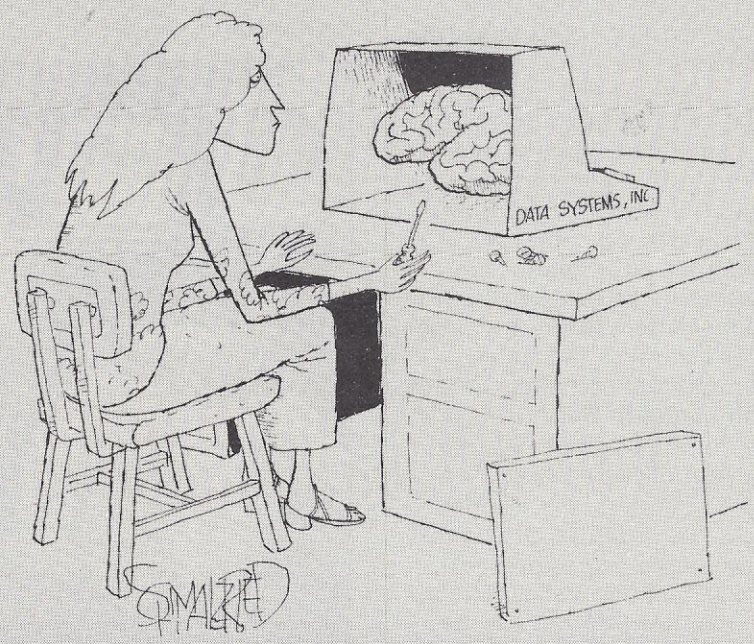
Devising a presentation of computer data output in an easily comprehended form to top-level corporate decision-makers has been a major problem, according to Peter Preuss, President of Integrated Software Systems, Corp.

"Those massive sheets of computer printout, with rows on rows of numbers, are an unacceptable tool to help the decision-maker quickly understand large amounts of data," said Preuss.

But the problem is being solved, he noted. Over the next three years Preuss predicts an upswing in the installment of automatic graph generators in top executives' offices, allowing them access to their company's computer for creating graphical representations of data, thus aiding them in their decision-making.

"A graphical representation of data is a logical approach to fast comprehension of masses of data," Preuss said. "Truly, one picture is worth a thousand words, and one chart or graph is worth a thousand columns of numbers.

"Computers have been able to generate charts and graphs since the late 1950s, but only a computer specialist could produce them. Now, we have reached the



stage where the decision-makers themselves can generate the charts and graphs with the aid of the computer."

For instance, he noted, top-level executives at large companies and government agencies can use a video display terminal in their own offices to request and receive plots on the TV-like screen illustrating sales, financial, production or marketing data. They can also obtain printed versions of the charts for use in formal reports. Quality of these illustrations is comparable to good manual drawings from a graphics arts department.

"Progress has been made in developing inexpensive hardware to produce those pictures right in the office," Preuss said.

Examples of such recent developments in software are ISSCO's DISSPLA and TELL-A-GRAF programs. These systems provide graphics-arts quality plots in the form of XY diagrams, bar charts, pie charts, maps and 3-D plots.

DISSPLA, which was introduced in 1970 and runs at more than 150 installations, can be operated on any mainframe computer, and produces its plot on any graphics devices, including plotters and microfilm recorders. TELL-A-GRAF, introduced in 1977, is a language processor that enables users to employ DISSPLA using simple English commands.

"What is happening" said Preuss, "is that the decision-maker is gaining direct access to his company's computer for aid in analyzing and keeping abreast of his organization's activities. He no longer has to work through a computer guru."

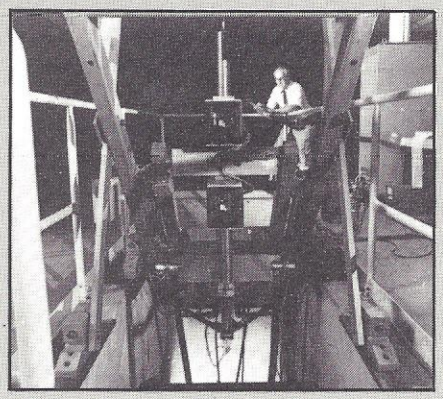
Shaky Situation

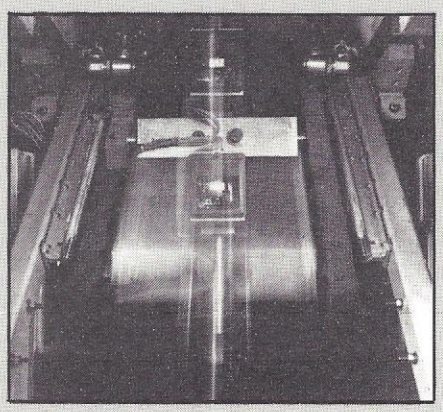
Custom-built computer-controller seismic test equipment has been installed at the relay-instrument division of Westinghouse Electric Corporation in New Jersey to duplicate earthquakes and document the immunity levels of protective relays during earthquakes.

According to seismologists,the earth is trembling all the time, but most of these tremors are minor. In earthquakes the movements are swift and happen in seconds. For the few seconds the earth is in motion, critical electrical equipment must perform reliably. For example, protective relays for nuclear power systems are essential to emergency reactor shutdown and heat removal from the containment vessel.

Protective relays must respond to an electrical fault or an abnormal condition to isolate the fault and protect the system. This job must be done in all situations, with no margin for error.

With the new seismic test equipment in place, engineers at Westinghouse violently shake sensitive protective relay equipment as many as 60 to 70 actual 20-second earthquakes. Relays can be tested in horizontal, 45° and 90° configurations. After the seismic test, the relays are individually tested to make sure they are within their specified tolerances.





Career Seminars

Management Resources International has announced the following career enhancement seminars to be presented around the country.

Auditing On-Line Systems: Washington, DC, February 7-9; Los Angeles, CA, February 14-16; Stamford, CT, April 4-6.

EDP Operational Audits: Washington, DC, March 5-7; Houston, TX, May 7-9; Washington, DC, June 25-27.

Designing an Automated Integrated Financial System: Los Angeles, CA, March 7-9; Washington, DC, April 11-13; Houston, TX, April 23-25; Atlanta, GA, May 9-11; Stamford, CT, June 6-8.

EDP Security Plans: Washington, DC, February 5-7; Houston, TX, April 9-11; Washington, DC, June 4-6.

For more information contact Management Resources International, 6621 Electronic Drive, Springfield, VA 22151.

Literature on tape

Cassette magazines for both the PET and TRS-80 are now available on a monthly basis.

Level I Magazine is an audible magazine written for the TRS-80 computer. The magazine is produced on a C-60 cassette with every issue written in both Level I and Level II. The magazine format, with a minimum of 40K of programming per side, is broken down into 16K loads.

Each issue has 25 recurring articles including information, sports instructions and self analysis. Each issue contains two game programs, graphic displays and educational aids.

Level I is sold on an annual or semi-annual subscription basis. A 6 month subscription is $22; a one year subscription is $40. Single issues normally are $4.00, but the premiere issue goes for $3.00. For more information contact

Level I Magazine, P.O. Box 8316, Anaheim, CA 92802.

Cursor, a monthly cassette magazine written for the Commodore PET computer, contains featured games as well as other programs for the 8K PET.

Cursor provides practical programs for business, statistical data analysis and home use. There are educational programs for children and some computer lore for dedicated "hackers". The magazine is mailed monthly First Class on a C-30 cassette. It's available for $24 for 12 issues from *Cursor,* Box 550, Goleta, CA 93017.

Computer-Aided Design

Michigan State University engineering students are making a start at computer-aided design, using newly developed computer hardware and software.

This application allows design of bridges, cars, planes, tractors, combines, houses and industrial plants. Engineers easily and quickly create a design and see the proposed product in front of them on a graphics screen or in a computer printout. With the computer, the proposed product can be analyzed for stress, vibration, heat and other factors, and checked against government and industry standards or production.

James Bernard, assistant professor of mechanical engineering, directs the new Case Center for Computer-Aided Design. Bernard cited a variety of potential uses for computer-aided design, some of which are already in operation in American industries.

For example, plant layout can be accomplished. A company figures out where to put an array of heavy machinery and, when satisfied all bugs are out of the floor plan, runs off printouts of the plan for themselves and the installers. Or, engineers can estimate and confirm the stresses on buildings which might result from earthquakes. Agricultural engineers can use the computer to design farm equipment. And, in mass production with fabrics as chunky as seatcovers or as flimsy as chiffon evening gowns, manufacturers can determine the best way to place patterns on the layered fabrics to be cut. Then, they produce computer programs to cue their cutting machines.

Double your Pleasure Double your Fun

You can double the enjoyment you get from your computer by combining computing with another hobby — model railroading, gardening, model rocketry, stamp or coin collecting, art, games, needlepoint, audio, crafts, rockhouding or whatever else your special interests may be.

And you can quadruple your enjoyment if you write up your hobby application and submit it to *Personal Computing* magazine. The best articles we receive will be published in the magazine; and the best of the best will be selected by Editor/Publisher Harold G. Buchbinder for presentation at the NCC'79 session on "Personal Computers in Other Hobbies", which he's chairing. And you can be there to talk about about what you did and how you did it. Reprints (or preprints, if the the article hasn't been published by show time) will be available for for session attendees.

NCC'79 will run June 4 to 7 in the New York Coliseum, with the special section on personal computing held in the Americana Hotel.

Send your hobby application write-ups to the Editor, Personal Computing, 1050 Commonwealth Ave., Boston, MA 02215.

Club Updates

Two users groups, one a general computer hobbyist club and the other a Poly-88 users group, have announced changes in their policies and services. Another TRS-80 group is just starting.

The Atlanta Area Microcomputer Hobbyist Club has voted to change its name to the Atlanta Computer Society. Meetings are held the last Wednesday of each month at 7:30 pm in the Community Room of Decatur Federal Savings and Loan Assn., Dunwoody Branch, 1630 Mount Vernon Road, Dunwoody, GA. For more information write ACS, P.O. Box 88771, Atlanta, GA 30338.

The Poly-88 Users Group has announced expansion of services to PolyMorphic 8813/8810 disk system owners.

Most of the current library of programs for the Poly-88 will be available on a basis similar to the cassette versions. Members may contribute a new program in exchange for their choice from the library or save the credit for a future choice. Members may also request programs for $2.50 each for handling and shipping on a disk they furnish. The users group will also provide a blank disk for $3.

Membership is $5 (US, Canada and Mexico), $15 foreign including 12 issues of the newsletter published every 2 to 4 months. Send $1 for the latest issue to Poly-88 Users Group, 1477 Barrington-#17, Los Angeles, CA 90025.

A new Radio Shack computer club, called the Redwood Empire TRS-80 Users Group, is being formed in San Francisco. For more information contact John Revelle, 7136 Belita Ave., Rohnert Park, CA 94928; (707) 528-1416.

If you have a photo of your system you'd like to share with our readers, send it to Random Access, Personal Computing.

LOOKING FOR THE NEW KENTUCKY FRIED CHICKEN OR McDONALD'S? JUST OPEN YOUR EYES!

Back in the fifties, if someone had suggested you invest in a hamburger stand called McDonald's or a chicken store run by Colonel Sanders, you probably would have laughed. Most of us did. The few who didn't, and invested in KFC or Big Mac are millionaires today. They enjoy "finger lickin' good" profits and "have it all done" for them.

The whole trick to investing in your own business is to **keep your eyes open for something like a KFC or McDonald's**. A business that (1) requires a **small investment** that can be recouped quickly, (2) has an **enormous profit margin**, and (3) has great growing **consumer acceptance.**

There is such a business.

The business is computer portaits, and it's one of the hottest, most profitable new ideas around. International Entrepeneur's Magazine stated that there are locations that are currently grossing **from $2,000 to $4,000 a week**. Imagine, grossing up to $4,000 a week from a small investment.

that gives you **your own high volume, all cash business.** No franchise fees or royalty payments, **all the money is yours**.

Computer Amusement Systems, Inc., (CASI) of 11 West 20th Street in New York City, has taken today's hot trends—T.V., computers, and instant pictures and combined them to produce a computer portrait system that is high in quality, low in price, portable and **requires absolutely no photo or technical experience.**

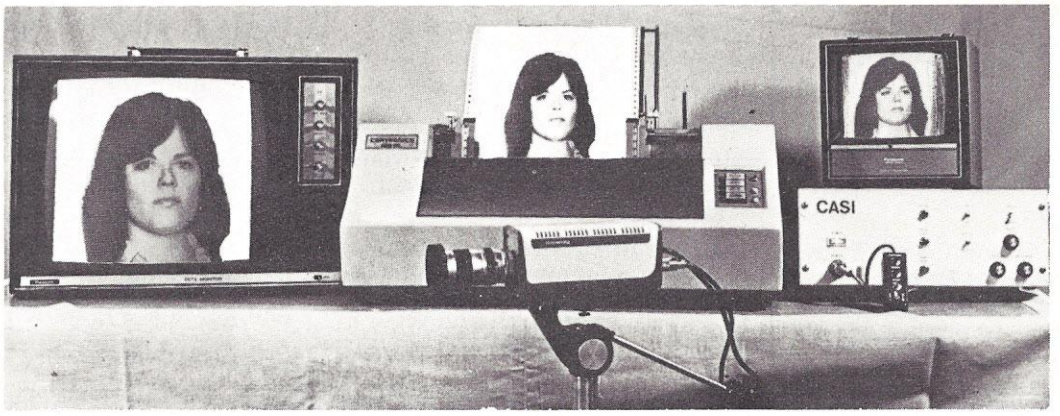
Easy to operate and easy to move, **the portable CASI system can be set up anywhere:** malls; flea markets; shopping centers; conventions; rock concerts, anywhere with high pedestrian traffic and just a little floor space. This **instant traffic stopper** will make a computer portrait in just fifty-five seconds! The picture is first seen on a T.V. screen, then dramatically printed before your eyes.

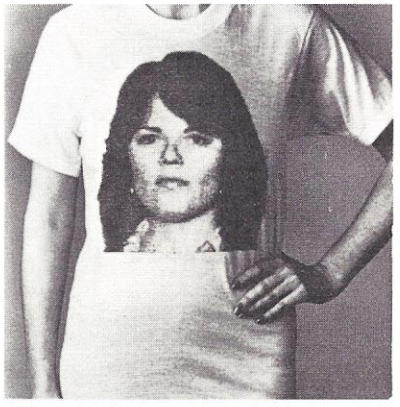
And there's more. You can transfer the portraits instantly to **many high mark-up, big profit items**—tote bags, T-shirts, calendars, puzzles, dart games—whatever the latest trend might be. CASI supplies the wholesale sources for everything you need to be in on the profits.

And there's more. Like special options that allow personalized messages to be printed right on the computer portrait. Or programs that will print out personal bio-rhythm charts in seconds. **All big moneymakers**.

So open your eyes to the most dynamic, profit making opportunity of the year. **Perfect for part time, full time, family operation or absentee management**, CASI is your ticket to success. Start putting money in your pocket today with CASI computer portrait systems. Don't send money just write for details. We'll send them right away.

Before you make an important decision in this exciting new business, know who you're buying from. We suggest you ask your banker about us.





YES! I WANT TO BE THE FIRST IN TOWN TO CASH IN ON COMPUTER PORTRAITS. PLEASE RUSH DETAILS

Name _____

Address _____

City _____ **State** _____ **Zip** _____

Home Phone _____ **Business Phone** _____

CASI

COMPUTER AMUSEMENT SYSTEMS INC.
11 West 20 Street New York, N.Y. 10011, Dept. 10
(212) 929-8355

P

CIRCLE 7

Stan's Paper-Cutting Program

BY TIMOTHY PURINTON

"Take a look, Pop," said Stan, thrusting a sheet of paper between his father's nose and the sports page.

His father leaned back and stared. "Hmm. Looks very complicated. Now if you don't mind –"

"But, Pop, it's a *useful* program. Maybe I can make a few bucks with my computer."

"Stanislaus," his father said, "you have my attention. What've you got there?" And they went over it together.

Stan's pop knows that job printers buy paper in large sheets, in reams of 500 sheets, to serve as their stock for printing small sheets, such as folders and brochures. In reckoning jobs, printers have to figure out the most efficient pattern of cuts and how much stock they'll need to handle a given job. (Similar but more complicated problems arise when a dressmaking company cuts cloth, because the pieces aren't rectangular, and pattern is a concern. A lumberman has some of the same problems cutting building materials from logs – three dimensional complications.)

Stan's program for printers is straightforward though a bit circuitous. ("So it's full of afterthoughts," says Stan. "Handsome is as handsome does." And it does print out its answers quickly and truly.) Input the dimensions of the stock and those of the finished piece, and say how many copies you want.

If the specifications say that the "grain" of the paper in the finished piece must run a particular way, then the reckoning is done only for that orientation. Otherwise the program seeks out the optimum yield, trying it both ways and checking the possibility of getting extra cuts from the trim. Readers may wish to add a cost reckoning of the paper stock and perhaps a graphic representation of the optimum cut. □

Program Run

```
  RECKONING PRINTING PAPER REQUIREMENTS
 JUNE 1 '78, ON A COMPAL 80

THIS PROGRAM WILL CALCULATE THE MOST EFFICIENT CUTS
OF RECTANGULAR PIECES FROM RECTANGULAR STOCK --
PROVIDED GRAIN-DIRECTION IS NO CONSIDERATION.
IS THIS A VALID ASSUMPTION IN THIS CASE (Y/N)? Y

PAPER STOCK DIMENSIONS (W,H)? 38,48
FINISHED PIECE DIMENSIONS (W,H)? 25.5,11
QUANTITY OF COPIES WANTED? 6200

MAXIMUM CUTS PER SHEET OF STOCK 5
FOR THE  6200  COPIES WANTED, THAT'S  1240 SHEETS
PLAN TO CUT WIDTHS-OF-PIECES FROM WIDTHS-OF-STOCK.
GET ADDITIONAL CUTS FROM THE TRIM.
THIS YIELD IS  76.8915 %.
WE'LL NEED  3  REAMS OF STOCK.
WE'LL HAVE 260 SHEETS LEFT OVER.
TO REVIEW, PIECE IS  25.5  BY  11  ;STOCK IS  38 BY  48
```

Illustration by David Bastille

Program Run – continued

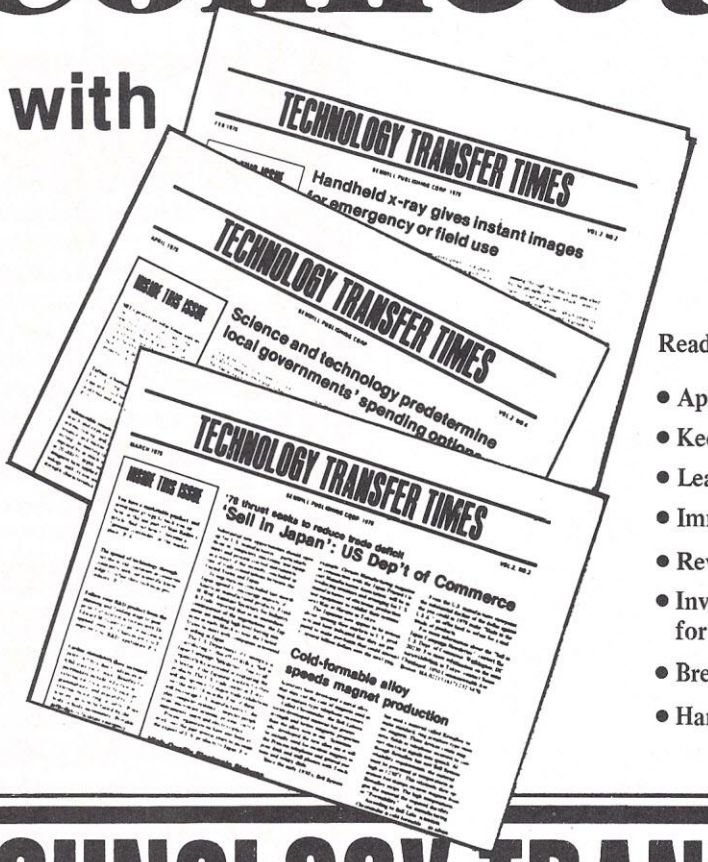
```
THIS PROGRAM WILL CALCULATE THE MOST EFFICIENT CUTS
OF RECTANGULAR PIECES FROM RECTANGULAR STOCK --
PROVIDED GRAIN-DIRECTION IS NO CONSIDERATION.
IS THIS A VALID ASSUMPTION IN THIS CASE (Y/N)? N

THEN ORIENT THE GRAIN TO LET US RECKON ONLY ON CUTTING
THE WIDTH OF THE PIECE FROM THE WIDTH OF THE STOCK...

PAPER STOCK DIMENSIONS (W,H)? 38,48
FINISHED PIECE DIMENSIONS (W,H)? 11,25.5
QUANTITY OF COPIES WANTED? 6200

WE'LL GET  3  PIECES FROM ONE SHEET.
FOR THE  6200  COPIES WANTED, THAT'S  2067 SHEETS
THIS YIELD IS  46.1349 %.
WE'LL NEED  5  REAMS OF STOCK.
WE'LL HAVE 434 SHEETS LEFT OVER.
TO REVIEW, PIECE IS  11  BY  25.5  ;STOCK IS  38 BY  48
```

Program Listing

```
10 PRINT "  RECKONING PRINTING PAPER REQUIREMENTS"
12 PRINT " JUNE 1 '78, ON A COMPAL 80"
14 PRINT: GOTO 45
20 INPUT "PAPER STOCK DIMENSIONS (W,H)"; SW, SH
30 INPUT "FINISHED PIECE DIMENSIONS (W,H)"; PW,PH
40 INPUT "QUANTITY OF COPIES WANTED"; Q: PRINT: IF A$<>"Y" THEN
 520
41 GOTO 60
45 PRINT "THIS PROGRAM WILL CALCULATE THE MOST EFFICIENT CUTS"
46 PRINT"OF RECTANGULAR PIECES FROM RECTANGULAR STOCK --"
47 PRINT"PROVIDED GRAIN-DIRECTION IS NO CONSIDERATION."
48 INPUT "IS THIS A VALID ASSUMPTION IN THIS CASE (Y/N)";A$:PRI
NT
49 IF A$<>"Y" THEN 500
50 GOTO 20: REM -- RECKONING OPTIMUM YIELD
60 W1=SW/PW: REM -- THAT'S STOCK WIDTH/PIECE WIDTH
65 W2=SH/PH: REM -- THAT'S STOCK HEIGHT/PIECE HEIGHT
70 X1=INT(SH/PW)*INT(((SW)MODPW)/PH)
80 X1=X1+(INT(SW/PH))*INT(((SH)MODPH)/PW)
90 C1=(INT(W1)*INT(W2))+X1: REM - THAT'S RANK*FILE+EXTRAS
100 REM -- OR SUPPOSE IT'S LAID OUT THE OTHER WAY
110 W3=SW/PH: REM - THAT'S STOCK WIDTH/PIECE HEIGHT
115 W4=SH/PW: REM THAT'S STOCK HEIGHT/PIECE WIDTH
120 X2=INT(SH/PH)*INT(((SW)MODPH)/PW)
130 X2=X2+INT(((SH)MODPW)/PH)*INT(SW/PW)
140 C2=(INT(W3)*INT(W4))+X2: REM -- THE OTHER RANK*FILE+EXTRAS
150 IF C1>=C2 THEN RM=1: GOTO 170
160 C=C2: AM=1: GOTO 180
170 C=C1
180 PRINT "MAXIMUM CUTS PER SHEET OF STOCK"; C
185 QC=Q/C:IFQC<>INT(QC) THEN QC=INT(QC)+1
190 PRINT "FOR THE "; Q;" COPIES WANTED, THAT'S "; QC;"SHEETS"
195 GOSUB 250
200 PRINT "THIS YIELD IS ";(C*(PW*PH))/(SW*SH)*100;"%."
210 R=(Q/C)/500: IF R=INT(R) THEN 230
220 E=500-((Q/C)MOD500): R=INT(R+1)
230 PRINT "WE'LL NEED "; R;" REAMS OF STOCK."
240 IF E>0 THEN PRINT "WE'LL HAVE"; E; "SHEETS LEFT OVER."
245 PRINT"TO REVIEW, PIECE IS ";PW;" BY ";PH;" ;STOCK IS ";SW;"
BY ";SH
246 END
250 REM -- HELPFUL INFORMATION
260 IF RM=1 THEN GOSUB 300: RM=0
270 IF AM=1 THEN GOSUB 350: AM=0
280 RETURN
300 PRINT "PLAN TO CUT WIDTHS-OF-PIECES FROM WIDTHS-OF-STOCK."
310 IF X1>0 THEN PRINT "GET ADDITIONAL CUTS FROM THE TRIM."
320 RETURN
350 PRINT "PLAN TO CUT HEIGHTS-OF-PIECES FROM WIDTHS-OF-STOCK."
360 IF X2>0 THEN PRINT "GET ADDITIONAL CUTS FROM THE TRIM."
370 RETURN
500 PRINT "THEN ORIENT THE GRAIN TO LET US RECKON ";
502 PRINT"ONLY ON CUTTING "
510 PRINT"THE WIDTH OF THE PIECE FROM THE WIDTH OF THE STOCK...
"
511 PRINT: GOTO 20
520 C=INT(SW/PW)*INT(SH/PH)
530 PRINT"WE'LL GET "; C; " PIECES FROM ONE SHEET."
540 GOTO 185
```

Get The Connection

with



Read TTT and:

- Apply innovations from one field to another.
- Keep up-to-date on the work of others.
- Learn new management techniques.
- Immerse yourself in a two-dimensional think-tank.
- Review patent activity.
- Investigate national and international markets for your ideas.
- Break interdisciplinary barriers.
- Harvest the field of technology transfer.

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BASIC with Style

BY JOHN M. NEVISON

We ought to give the whole of our attention to the most insignificant and most easily mastered facts and remain a long time in contemplation of them until we are accustomed to behold the truth clearly and distinctly.

Rene Descartes
Rules for the Direction of the Mind

A great deal depends on how you type in a program. How fast you read a line, how easily you understand a block of code and how much time you spend debugging the program are all affected by the clarity of your initial typing. Pay attention to this dull chore and do it with a little thought. You will make your program easier to work with.

RULE 1 – Space symbols so that the line may be easily read.

An unspaced line strains eyes and suffocates meaning. Ventilate a line with space so its symbols express themselves clearly to the eye.

Weak

```
200 REM ILLEGIBLELINE
201
900 PRINT "PRINTEDRESULTS";R
```

Strong

```
200 REM     LEGIBLE LINE
201
900 PRINT "PRINTED RESULTS ";R
```

Spacing can improve even simple lines of familiar words. Both REM and PRINT statements benefit from thoughtful typing.

Weak

```
200 LETL=10*(3+4)
201
400 FOR R=31TOXSTEPS
401
500 IF B>.375 THEN 780
501
600 LET T=3.12456*D
```

Strong

```
200 LET L = 10 * (3+4)
201
400 FOR R = 31 TO X STEP S
401
500 IF B > .375 THEN 780
501
600 LET T = 3.12456 * D
```

Setting off the equals sign and other relational operators with spaces makes them easier to read. A letter used as a variable needs to be separated from the words in a statement. The bad examples in 200 and 400 violate Standard BASIC. All BASIC commands must be set off by at least one space. If your version of BASIC allows cramped lines, avoid them.

Weak

```
800 READ A,B,C
810 DATA 150,175,185
```

Strong

```
800 READ   A,   B,   C
810 DATA 150, 175, 185
```

Sometimes thoughtful spacing can dramatically reveal a line's meaning. Except where noted, even the bad examples in this article are correct BASIC statements. Good lines result from thinking beyond mere syntax to meaning and form.

RULE 2 – End a block of program with a blank line.

Just as sentences collected around a thought form a paragraph, lines of code collected around an idea form a block of program. Like a paragraph, a block should be followed by a blank line.

Weak

```
180 REM READ AND TOTAL
200 READ A
210 IF A = -1 THEN 240
220 LET T = T+A
230 GO TO 200
240 DATA 4, 3, 5, 7
250 DATA -1
260 PRINT "TOTAL IS "; T
```

Strong

```
100 REM    READ AND TOTAL
110
120 READ A
130    IF A = -1 THEN 160
140     LET T = T + A
150 GO TO 120
160
170 DATA 4, 3, 5, 7
180 DATA -1
190
200 PRINT "TOTAL IS "; T
210
```

Three ideas yield three blocks of code: a loop that reads and tallies, a set of data and the printing of results. Together, the three blocks comprise a program *fragment*, not a whole program.

Standard BASIC mistakenly does not require the program to accept a simple blank line. An intelligent version of BASIC permits blank lines. If your version doesn't, use the REM-5 convention described in Rule 3.

Weak

```
200 REM STATISTICS
210 FOR I = 1 TO N
220 READ A(I)
230 LET T = T + A(I)
240 NEXT I
250 LET M = T/N
260 LET T = 0
270 FOR I = 1 TO N
280 LET T = T + (A(I)-M)^2
290 NEXT I
300 LET V = T/N
310 LET S = SQR(V)
320 PRINT "MEAN IS "; M
330 PRINT "VARIANCE IS "; V
340 PRINT "STANDARD DEVIATION IS "; S
```

Strong

```
200 REM    STATISTICS
210
220 FOR I = 1 TO N
230    READ A(I)
240    LET T = T + A(I)
250 NEXT I
260
270 LET M = T/N
280
290 LET T = 0
300 FOR I = 1 TO N
310    LET T = T + (A(I)-M)^2
320 NEXT I
330
340 LET V = T/N
350 LET S = SQR(V)
360
370 PRINT "MEAN IS "; M
380 PRINT "VARIANCE IS "; V
390 PRINT "STANDARD DEVIATION IS "; S
400
```

Five ideas, five blocks of code. The line LET M = deserves its own block, for it computes the arithmetic average (mean). Lines LET V = and LET S = compute two measures of the data spread. A standard statistics text will explain the procedure employed here. These five blocks are not a complete program.

What constitutes a block of code is the writer's decision. What ideas should be set off depends on what the writer seeks to emphasize. No editor who automatically grooms a program according to some of the rules in this article can replace the writer's decisions on block separation or spacing within a line. These considerations are matters of individual judgment.

RULE 3 – Distinguish comment from code.

Comments should reveal the code both by what they say and where they say it. Comments should not get in the way. When inserted among lines of code, comments should be preceeded and followed with blank lines. Clean code is its own best explanation and good typing should keep the code itself available to the eye.

Weak

```
10 REM CALENDAR LUNATIC
20 REM THIS PART
30 LET M = D/28
40 REM CONVERTS DAYS, D,
50 REM TO MOONS, M, AND
60 REM YEARS, Y.
70 LET Y = M/13
79
```

Strong

```
20 REM    CALENDAR LUNATIC
29
40 REM    THIS PART CONVERTS DAYS, D,
50 REM    TO MOONS, M, AND MOONS TO
60 REM    YEARS, Y.
69
80 LET M = D/28
90 LET Y = M/13
```

RULE 3 (continued)

Whenever possible, collect dispered remarks into a paragraph. When this is done in the above example, the eye sees at once that there are only two lines of code: LET M = and LET Y =.

Standard BASIC denies the writer an on-line comment. An intelligent version of BASIC overcomes this limitation. On-line remarks offer the writer a powerful tool that he can use or misuse.

When comments are kept well to the right, they do not clutter the code. Comments can sometimes say what the writer thought the code should do, not what it actually does. The reader has a right to examine the code without being distracted by comment.

On-line remarks can be abused. Use them sparingly. Most remarks are better collected into a paragraph.

Weak

```
200 REM COMPOUND INTEREST
210
220 LET B = 100 'BEGINNING AMOUNT
230 LET E = 0
235 LET I = 0
240
250 IF E > 170.85 THEN 320
260    LET I = .07 * B 'INTEREST
270    LET E = B + I  'ENDING AMOUNT
280    PRINT B, I, E
290
300    LET B = E 'NEW BEGINNING
310 GO TO 250
320
```

Strong

```
200 REM     COMPOUND INTEREST
210
220 LET B = 100                          'BEGINNING AMOUNT
230 LET E = 0
235 LET I = 0
240
250 IF E > 170.85 THEN 320
260    LET I = .07 * B                   'INTEREST
270    LET E = B + I                     'ENDING AMOUNT
280    PRINT B, I, E
290
300    LET B = E                         'NEW BEGINNING
310 GO TO 250
320
```

Strong

```
200 REM     THIS PART COMPOUNDS INTEREST
210 REM     ON A BEGINNING AMOUNT, B, UNTIL
220 REM     THE ENDING AMOUNT, E, EXCEEDS
230 REM     $ 170.85 .   THE INTEREST RATE
240 REM     IS .07 AND THE RESULTS ARE
250 REM     PRINTED FOR EACH PERIOD.
260
270 LET B = 100
280 LET E = 0
290 LET I = 0
300
310 IF E > 170.85 THEN 380
320    LET I = .07 * B
330    LET E = B + I
340    PRINT B, I, E
350
360    LET B = E
370 GO TO 310
380
```

Collected into an introductory paragraph, the remarks explain what the program does, let the code itself reveal how and keep the code clean and easy to read.

Weak

```
220 REM THE REM-5 CONVENTION
230 REM
240 REM I1+T1 >= 5,  I2 >= 5.
250 REM
260 REM I1 IS THE REM INDENT
270 REM T1 IS THE TAB FROM REM
280 REM     TO COMMENT.
290 REM I2 IS THE CODE INDENT.
300 REM
310 LET I1 = 1
320 LET T1 = 4
330 LET I2 = 5
340 REM
350 IF I1 <> 1 THEN 410
360 IF T1 < 4 THEN 410
370 IF I2 < 5 THEN 410
380 PRINT "THE REM-5"
390 PRINT "CONVENTION."
400 STOP
410 REM
420 PRINT "CHECK REM FORMAT."
430 REM
```

Strong

```
220 REM     THE REM-5 CONVENTION
230 REM
240 REM     I1+T1 >= 5,  I2 >= 5.
250 REM
260 REM     I1 IS THE REM INDENT
270 REM     T1 IS THE TAB FROM REM
280 REM        TO COMMENT.
290 REM     I2 IS THE CODE INDENT.
300 REM
310      LET I1 = 1
320      LET T1 = 4
330      LET I2 = 5
340 REM
350      IF I1 <> 1 THEN 410
360       IF T1 < 4 THEN 410
370         IF I2 < 5 THEN 410
380          PRINT "THE REM-5"
390          PRINT "CONVENTION."
400          STOP
410 REM
420      PRINT "CHECK REM FORMAT."
430 REM
```

When remarks and blank lines must be REM statements, choose an indent convention that distinguishes comment from code. The REM-5 convention solves the problem.

RULE 4 – Use line numbers of equal length.

Indentation is a potent visual force. Poorly chosen line numbers can weaken or destroy indentation's effect.

Should your BASIC have a resequencer, you need not worry about line numbers until you have finished typing. At that time, be sure the line numbers are of equal length.

If you lack a resequencer, number the program between 20 and 90, 200 and 900, or 2000 and 9000 so that later additions can preserve the original numbers' length.

Programs should be as independent of line numbers as possible. Even if you do not resequence your program, someone else may. If the program is styled in a way that does not depend on line numbers it will withstand resequencing. □

Weak

```
1 REM     THE SLOPPY CODE
10 REM     WILL SLIP A SPACE
1000 REM     AND OFTEN LOOK A FRIGHT.
```

Strong

```
200 REM     DOGGEREL
210 REM
220 REM     THE SLOPPY CODE
230 REM     WILL SLIP A SPACE
240 REM     AND OFTEN LOOK A FRIGHT.
250 REM
260 REM     THE SLICKER LINES
270 REM     WILL HAVE THE GRACE
280 REM     TO SET THEMSELVES ARIGHT.
290 REM
```

Sample Program

This utility program, HISTGRAM, exemplifies the form and style recommended in John Nevison's *Little Book of BASIC Style.* The clear, well-laid-out program makes for fast, easy reading – no more eye squinting, no more brow furrowing, no more head scratching.

HISTGRAM is useful for many applications. Notice how, instead of inserting several short lines in the print block, this program uses the length function FNL to convert length in units to length in characters across the page.

```
100 REM    HISTGRAM          17 JULY 1977          JOHN M. NEVISON
110
120 REM    PRINT A HISTOGRAM OF THE DISTRIBUTION OF N9 RANDOM NUMBERS.
130
140 REM    VARIABLES:
150 REM        H()...THE LENGTH OF EACH HISTOGRAM BAR
160 REM        I.....THE HISTOGRAM INTERVAL
170 REM        J,K...INDEX VARIABLES
180 REM        M.....THE MAXIMUM H()
190 REM        X.....A RANDOM NUMBER
200
210 REM    CONSTANTS:
220     LET N9 = 20                    'NUMBER OF HISTOGRAM BARS
230     LET L9 = 35                    'LENGTH OF THE LARGEST BAR
240 REM                                '  IN CHARACTERS ACROSS THE PAGE
250     LET N9 = 300                   'NUMBER OF RANDOM NUMBERS
260     LET R9 = 3                     'NUMBER OF RND'S IN EACH X
270
280 REM    DIMENSIONS:
290     DIM H(20)
300
310 REM    FUNCTIONS:
320
330 REM    FNL CONVERTS LENGTH TO LENGTH IN CHARACTERS SO THAT
340 REM    FNL(M) WILL BE L9 CHARACTERS LONG.
350
360     DEF FNL(L) = INT(L/M * (L9-1) + 1.5)
370
380 REM    MAIN PROGRAM
390
400 REM    GENERATE X, SORT IT INTO THE RIGHT HISTOGRAM BAR, H(K),
410 REM    CHECK FOR A NEW MAXIMUM.  WHEN DONE, PRINT THE HISTOGRAM.
420
430     LET I = R9 / H9
440     LET M = 0
450
460     FOR J = 1 TO N9
470
480        LET X = 0
490        FOR K = 1 TO R9
500           LET X = X + RND
510        NEXT K
520
530        LET K = INT(H9*X/R9) + 1
540        LET H(K) = H(K) +1
550        IF H(K) <= M THEN 570
560         LET M = H(K)
570
580     NEXT J
590
600     PRINT "FROM 0 TO "; R9; "IN INTERVALS OF "; I; "."
610     PRINT "MAXIMUM HEIGHT IS "; M; "POINTS."
620     FOR J = 1 TO H9
630        PRINT "I";
640        FOR K = 1 TO FNL(H(J))
650           PRINT "*";
660        NEXT K
670        PRINT
680     NEXT J
690
700     END
```

```
HISTGRAM  16 SEP 77  16:18

FROM 0 TO  3 IN INTERVALS OF  0.15 .
MAXIMUM HEIGHT IS  41 POINTS.
I*
I***
I*
I******
I**********
I******************
I****************
I******************************
I**********************
I***********************************
I****************************************
I*************************
I************************
I****************
I**********
I*****
I***********
I*
I***
I*
```

Get Some Answers


Minicomputer News

Oceanography

Ships' officers use simulators to learn vessel operation

DEC adds three disk drives and cuts RK06 prices

DG printer line made in-house, offers international fonts

Inside This Issue

Oceanography

Sections

Departments

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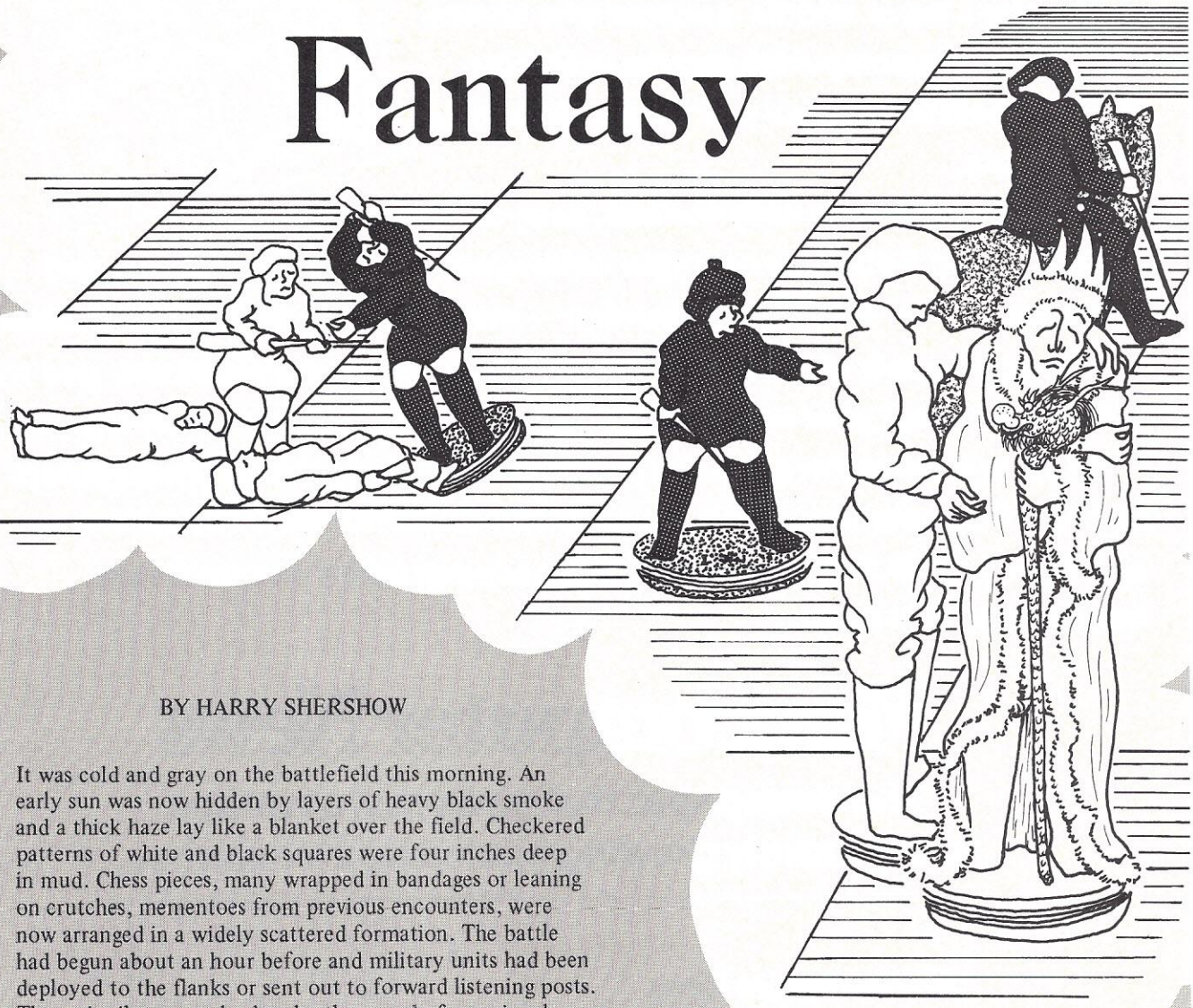
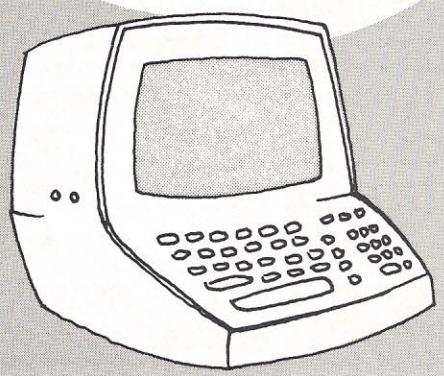
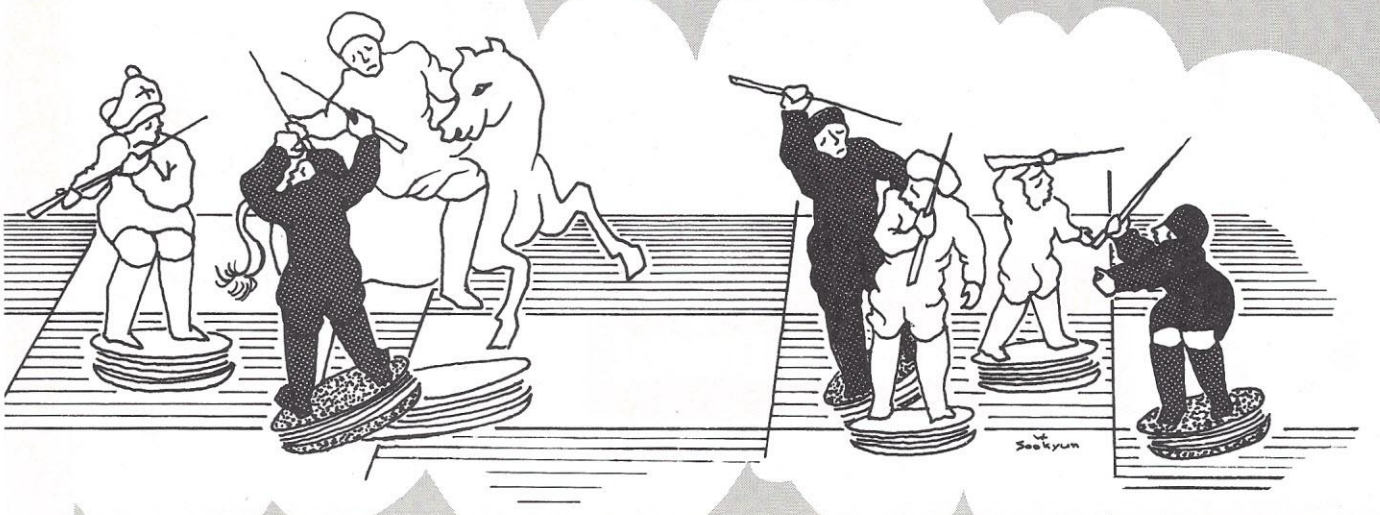
A Chessboard Fantasy



BY HARRY SHERSHOW

It was cold and gray on the battlefield this morning. An early sun was now hidden by layers of heavy black smoke and a thick haze lay like a blanket over the field. Checkered patterns of white and black squares were four inches deep in mud. Chess pieces, many wrapped in bandages or leaning on crutches, mementoes from previous encounters, were now arranged in a widely scattered formation. The battle had begun about an hour before and military units had been deployed to the flanks or sent out to forward listening posts. The eerie silence was broken by the sound of occasional clanking of armor as a Knight darted about on a reconaissance mission gathering information for his King and looking for a possible unprotected enemy. Once there was a rumble from the side and an ominous-looking Rook appeared for a moment as though about to launch a frontal attack upon one of the helpless Pawns. Then, on second thought, he retreated to the side of his Bishop. Pawns of both sides peered uneasily forward, their shoulders sagging, their heads bowed, agony in their eyes. They had been over this ground many times before and had suffered so many losses and such frequent captures that they no longer looked at the future with any comfort.





The Queen's Pawn stood alone at the front of the ranks. He had been the first to move and very shortly was to be the first casualty. He was usually the first one out, and the first one in. His whole path through life had, as a rule, never extended beyond the fourth rank. Never, in all his existence since the Middle Ages, had this particular Queen's Pawn reached the Paradise of the eighth rank. Not once in his existence had he ever received the ovations and the thrills of being crowned "Queen for a day!" as a reward for reaching that "Golden Grange". Instead, usually, it was his misfortune to be the first fatality in the chess game – the first piece to be snatched off the board. Trembling with fright, the Queen's Pawn stood by himself, contemplating the unfortunate circumstance of his existence. He drew his tattered white cloak tightly around him, trying to protect himself from the forces of evil confronting him. The seams of the white oak wood that formed his structure had spread apart in the passing of decades. Deep, ragged fissures now ran the length of the figure from the topmost pip on the head to the very bottom.

His loneliness was suddenly relieved by the King's Pawn that had appeared at his side. "Hello, brother," whispered KP. "How goes the battle?"

"Grumph," muttered QP shivering in despair, but inwardly glad to have some company. "Just barely moving. What else can one do? Just barely stay alive!"

"Cheer up brother," said KP with an encouraging smile. "You have friends behind you and every day brings new hope."

"Grumph," muttered QP "Have you any idea what it's like to be out here alone?"

"I have been alone on some occasions."

"Very few, my friend. Very few. How different things are these days now that the machines have arrived. Do you know how many times in the past I was held by the great Capablanca? His warm, trembling, moist hands would lift me gently and tenderly and coddle me for a minute against his cheek before setting me down carefully onto a new square. Like a child being led safely across a busy street by its mother. Now we are thumped, bumped and pushed around by the computer. We live in a world of magnets, now, my friend. There no longer are warm hands to hold us. Sometimes I wish I were dead – or at least a King's Knight Pawn! He, at least is treated with a good deal more consideration than I am. Or than you, for that matter."

"Indeed?" said KP.

"Yes," said QP. "Look at him." The two glanced down the rank, where, near the end, of the formation, stood the KNP – sound asleep. "Now, there's a fellow who has an easy time of it," said QP. "Hardly anyone pays attention to him. Sometimes, months go by before he has been moved forward as much as a single square."

"Well," said KP, who was a philosopher. "Standing still and doing nothing is his greatest strength."

"But regard how soundly he sleeps," moaned QP. "He doesn't even bother to look up once in awhile. There could be an enemy breathing directly into his face, and he wouldn't know it. He could be less concerned about the battle. Often, when he can't sleep, he spends the idle hours counting the times the Knights leap over him. That is his only diversion in life. And when it is all over, quite often he will still be found in the same place. Still asleep."

"Haven't you had some great moments in your own life you can recall?" asked KP trying to cheer up his brother.

"Very few. I once was in the famous chess games that Richard the Lion Hearted played with his veterinarian."

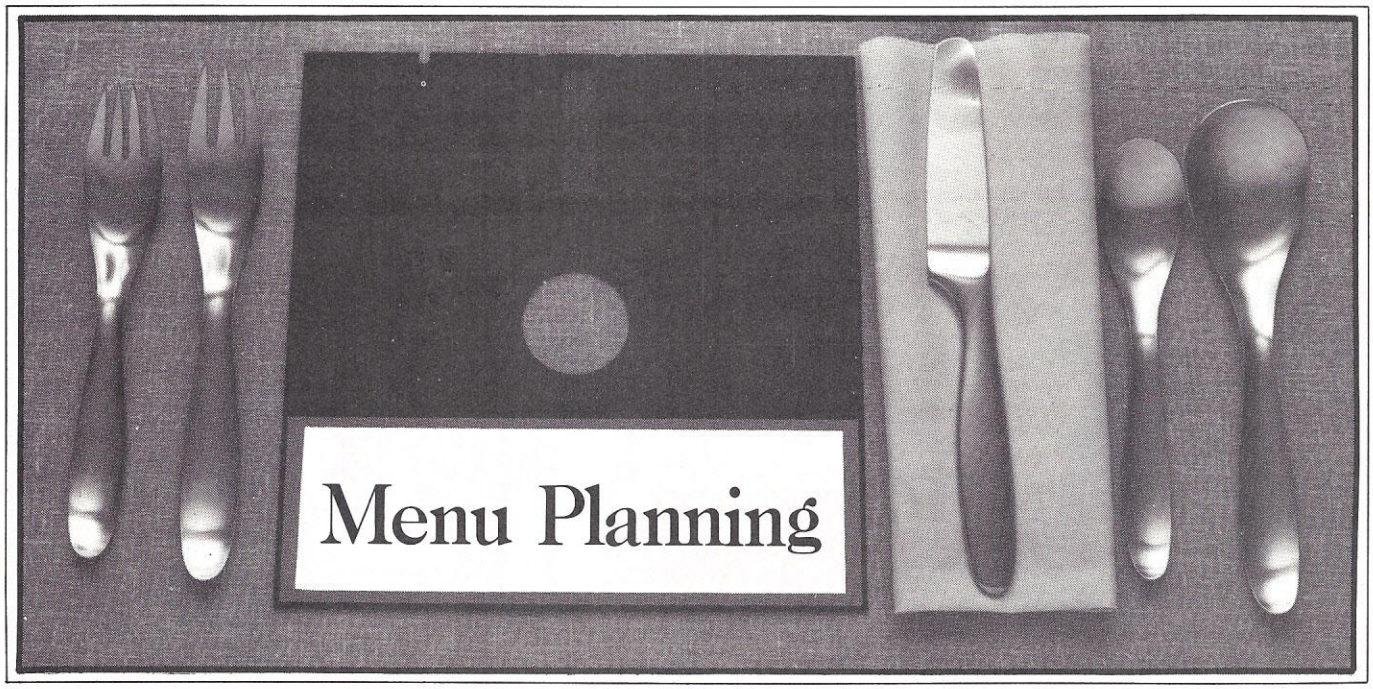
A Black Bishop lurked in the distant shadows, his evil eyes measuring QP. Throwing a fold of his long ebony robe over his shoulder he darted forward onto the square occupied by QP and laid his hand on the Pawn's drooping shoulder.

"So soon?" sobbed QP.

"In nominie Patris, et Filii, et Spiritus Sancti. Amen." chanted the Bishop and quickly dispatched the captive to a nearby stockade.

"Goodby my friend," yelled KP as his buddy disappeared. "Be of stout heart! Every day brings new hope!"

A brief silence fell over the field. The only sound that could be heard was the whirring of tiny fans cooling off the battery of computers. A little puff of battle smoke rose up from where QP had once stood. It drifted off into the skies and was soon lost forever in space. □



Menu Planning

BY CAROLYN BUSCH AND SAM NEWHOUSE

This program is designed to help you monitor, regulate and improve your diet. For the serious nutritionist or dieter, the Menuplan Program can save many hours calculation to determine daily average nutrients in the foods you eat.

Furthermore, the program generates a listing of a week's menu and a shopping list of all ingredients needed to prepare the meals.

Everyone has his own food preferences, dietary goals, and beliefs concerning values of various vitamins. No particular diets or nutritional practices are recommended here. The foods listed and the dietary standards mentioned in the program are those of the authors only, and may be readily changed by the reader.

One caution though: *consult a doctor* before starting any diet or significantly altering your food intake!

The Program will produce "balanced" menus, limiting calories to the average daily input you select. This "balancing" is achieved by observing two nutritional standards. These standards are our own, but were derived after study of U.S. recommended daily allowances (RDA) for various nutrients. We also consulted various books on health and nutrition.

Before going into detail on these two standards, we will discuss the general flow of the program. This will make use of the standards clearer. (Please refer to the Flowchart).

The program starts by requesting from the operator the number of menus desired, the number of people who will be eating dinner, and the desired daily average calorie content for dinner.

Next, a choice is randomly made from each of six courses: Main Course, Appetizer, Vegetable, Grains, Desserts and Beverages. (The program may also randomly select "none" for any of the courses.)

The above is repeated each day up to the number of days requested. At this point, a random, (possibly unbalanced) set of menus has been selected. The nutritional content of every item on each day's menu is added up, and the totals divided by the number of days. The result produces an initial set of daily, average-nutrient figures.

This set of nutrient averages is then compared with the "Phase I" standard. *Any* nutrient value that fails its initial test causes the entire set of menus to be rejected. A new set of menus is then randomly selected. Also, the reason for rejection is printed out.

Table 1 shows the initial standard. Remember, this is for *dinner only.*

Notice that the desired amount of

TABLE 1

PHASE I STANDARD

(DAILY AVERAGE INTAKE, NO CONDIMENTS INCLUDED)

Line #	Nutrient #	Name	Desired Amount
360	1	Calories	200 less than the maximum which the user specified
370	2	Protein	At least 30 grams
380	3	Fats	Not more than 100 grams
390	4	Carbohydrates	Not less than 40 or more than 100 grams
400	5	Calcium	Not less than 150 milligrams
410	6	Iron	Not less than 5 milligrams
420	7	Sodium	Not less than 600 milligrams
430	8	Vitamin A	Not less than 2000 IU's
440	9	Vitamin B (complex)	Not less than 15 (index)
450	10	Vitamin C	Not less than 40 milligrams
460	11	Vitamin D	No standard
470	12	Vitamin E	No standard

calories is 200 calories *less* than the amount suggested by the user. This is done to "save room" for some supplementary foods, discussed below.

In Table 1 no standards are imposed for Vitamins D and E. This is because these nutrients are not present to a significant degree in the first six courses: Main Course, Appetizer, Vegetables, Grains, Desserts, Beverages.

The reason vitamins D and E are not included in these courses is that these vitamins are, in fact, not contained in many foods. However, the supplementary foods described below contain quantities of vitamins D and E.

In Table 1 vitamin B (complex) is expressed in terms of "index" units. This was done because vitamin B (complex is not directly measureable, and consists of all the B vitamins which *are* measurable. However, breaking down the various B vitamins would have required more storage and time. We have therefore assigned a number between 0 and 10 to each menu item to express its vitamin B (complex) content – 10 is maximum B (complex) content; 0 is minimum.

When a set of menus has passed the Phase I test, those menus are then displayed, one at a time.

When a menu is displayed, its nutritional analysis is printed below it. You can then change or delete any of the courses. After any changes are made, the corrected menu is displayed, together with a new nutrition analysis.

When the menus have all been reviewed, changed, and finally approved by the user, you may then add supplementary foods.

These foods include flavorings, both nutritious and non-nutritious, dairy foods, oil, condiments, and other food supplements.

Again, each day's menu is reviewed, and changed if desired, by the user. When all menus are complete, the program totals all the nutrients in the menu items to obtain the average daily nutrient intake.

These daily nutrient averages are then compared with "Phase II" standards. If any nutrient fails its Phase II test, an appropriate suggestion is printed which will correct the inbalance. The various suggestions may be used in several ways: First, go back to this point and alter your menus to comply with the suggestions; Next, use the suggestions to help plan your breakfast and lunch meals; Lastly, simply ignore the suggestions.

The user may ask for a complete analysis of the average daily nutrients.

TABLE 2

PHASE II STANDARD

(DINNER ONLY, INCLUDING ALL 9 POSSIBLE COURSES)

#	NAME	STANDARD
1	Calories	Maximum input by user at initialization
2	Protein	A low of 40 G. and a high of 80 G.
3	Fats	A low of 25 G. and a high of 50 G.
4	Carbohydrates	A low of 30 G. and a high of 70 G.
5	Calcium	A low of 500 MG.
6	Iron	A low of 8 MG.
7	Sodium	A low of 800 MG. and a high of 5000 MG.
8	Vitamin A	A low of 5000 IU's
9	Vitamin B	A low of 20 (index)
10	Vitamin C	A low of 250 MG.
11	Vitamin D	No standard
12	Vitamin E	No standard

Then, he may decide to make more changes, based on the nutritional analysis, or he may accept the menus as selected.

If the set of menus is accepted, the user may then print out the entire set of menus. Finally, a printout is obtained showing the complete shopping list of foods needed to make the menus selected for the number of people specified in the program.

The most important aspect of this program is the manner in which the nutrition information is stored, arranged and retrieved. For each menu item, there is a data statement containing its item # followed by 12 data entries, one for each of the nutrients in the program. This is a fixed-length data structure. That is, every item in the table has exactly the same number of data entries. Thus, there is no need for a special end-of-record indicator.

There are at least two ways to access data in data statements. One way is to read all the data into a matrix at the beginning of the program. After this, every data entry can be accessed by determining the value of the appropriate matrix element.

Another, slower, technique used in this program is to search through data

TABLE 3

RECOMMENDED DAILY ALLOWANCE (RDA)

(BREAKFAST, LUNCH, AND DINNER TOTAL)

#	NAME	STANDARD
1	Calories	None
2	Protein	None
3	Fats	None
4	Carbohydrates	None
5	Calcium	800 - 1400 MG.
6	Iron	10 - 18 MG.
7	Sodium	3000 - 7000 MG.
8	Vitamin A	5000 IU
9	Vitamin B	Separate standard for each of the many B vitamins
10	Vitamin C	45 MG.
11	Vitamin D	400 IU
12	Vitamin E	12 - 15 IU

statements until you find the data you are looking for. This is somewhat simpler, and takes less memory because both the data statements and a data matrix need not be in memory simultaneously.

Naturally, if you start searching at the beginning of the data every time you looked up an item in the table, you would use up a lot of time.

To save time, we have arranged data items by course number. Items 1 - 12 are Main Courses, 13 - 24 Appetizers, 25 - 36 are Vegetables, and so on. Main Course is Course 1, Appetizers are Course 2, Vegetables, Course 3, etc.

Let's go through the process of adding up the nutrients in a meal. First, the data pointer is set to the beginning of the data by using the "Restore" statement. Now, let's assume that a Cheese Souffle has been selected as the Main Course. This is item #3. The program searches through the Data Table until it finds the data for item 3, Cheese Souffle. Now the nutrients of the Cheese Souffle are added to the nutrient sub-totals.

At this point, the Data Pointer is positioned to read the next item in the table, item 4.

The next course is Course 2, Appetizers. The item numbers in the Appetizer Course are from 13 through 24.

The program searches through the Data Table until it finds the selected Appetizer. Assume this is Fruit Salad, item #23.

Again, the nutrients contained in the Fruit Salad are added to the nutrient sub-totals.

This process continues until all courses in the dinner have been located in the Table, and their nutrients added to the nutrient sub-totals.

The purpose of this explanation is to point out how time is saved by arranging the menu items by course. Since the item number range of each succeeding course is higher than the previous course, it is never necessary to go back to the beginning of Data Table.

On another subject, whenever you want to replace the item for a particular course, the items available for that course are displayed. If you want to eliminate a particular course, input 0 (zero) – as the new item number.

It is *not* necessary to choose one of the items displayed for the course you want to change. You can choose *any* item to replace the item you want to change.

Also, if you want to save time, you may specify at initialization that you do *not* want the listing of choices printed out. Instead, refer to the list printed out during initialization.

Changes in the program could in-

Menu Items

```
1   MACARONI & CHEESE (CUP)
2   CHEESE & TOMATO PIZZA (1/4)
3   CHEESE SOUFFLE (1/4 LB.)
4   SAUTEED CALFS LIVER & ONIONS
    (1/4 LB.)
5   BAKED FLOUNDER (1/4 LB.)
6   FRIED HADDOCK (1/4 LB.)
7   LOBSTER NEWBURG (100 G.)
8   BROILED SALMON (1/4 LB.)
9   MEAT LOAF (1/4 LB.)
10  HAMBURGER WITH ROLL,LETTUCE,
    TOMATO,CATSUP
11  ROASTED WHITE TURKEY(1/4 LB)
12  BROILED CHICKEN (1/2 LB)
13  COLE SLAW (CUP)
14  LETTUCE, TOMATO, AND
    MAYONNAISE SALAD (CUP)
15  ENDIVE WITH BACON DRESSING
16  TOMATO & ONION WITH CIDER
    VINEGAR AND OIL
17  WATERCRESS WITH BLUE CHEESE
18  CUCUMBER WITH CREME AND
    CIDER VINEGAR (CUP)
19  AVOCADO WITH TOMATOES AND ROMAINE
20  CHICKEN BROTH (CUP)
21  CREME OF ASPARAGUS SOUP(CUP)
22  SPLIT PEA SOUP (CUP)
23  FRUIT SALAD (CUP)
24  CANTALOUPE (1/4)
25  ARTICHOKE
26  ASPARAGUS (6 SPEARS)
27  GREEN BEANS (CUP)
28  CABBAGE (CUP)
29  STEAMED BEET GREENS (CUP)
30  STEAMED BROCOLLI (CUP)
31  STEAMED BRUSSEL SPROUTS(CUP)
32  SUMMER SQUASH (CUP)
33  CARROTS (CUP)
34  CAULIFLOWER (CUP)
35  BAKED POTATO
36  PEAS & ONIONS (CUP)
37  CORNBREAD (50 G.)
38  CRACKED WHEAT BREAD(SLICE)
39  FRENCH BREAD (SLICE)
40  ITALIAN BREAD (SLICE)
41  PUMPERNICKEL (SLICE)
42  BREAD STUFFING (CUP)
43  RYE CRACKER
44  BROWN RICE (3/4 CUP)
45  WHITE RICE (3/4 CUP)
46  CORN TORTILLA
47  BULGAR WHEAT (CUP)
48  NONE
49  DANISH PASTRY
50  VANILLA ICE CREAM (CUP)
51  BANANNA BREAD (SLICE)
52  GINGER BREAD (SLICE)
53  CHOCOLATE CHIP COOKIE
54  DATE NUT COOKIE
55  BLUEBERRY PIE (SLICE)
56  PECAN PIE (SLICE)
57  APPLE
58  ORANGE
59  SEEDLESS GRAPES (CUP)
60  DRIED FIG (1 LG.)
61  BEER (CUP)
62  WHITE WINE (CUP)
63  LIQUOR (1.5 OZ.)
64  CORDIAL (1.5 OZ.)
65  COCKTAIL JUICE (CUP)
66  COFFEE (CUP)
67  TEA (CUP)
68  COLA (CUP)
69  UNSWEETENED APPLE JUICE(CUP)
70  ORANGE JUICE (CUP)
71  WATER
72  GRAPE JUICE (CUP)
73  YOGURT (1/2 CUP)
74  PARMESAN CHEESE (1 OZ.)
75  SWISS CHEESE (1 OZ.)
76  HALF & HALF (TBS)
77  HOLLANDAISE SAUCE (TBS)
78  BUTTER (TBS)
79  COTTAGE CHEESE (1/2 CUP)
80  HONEY (TBS)
81  LIME JUICE (TBS)
82  CHOPPED PARSLEY (1/2 CUP)
83  RAISINS (1/4 CUP)
84  POPCORN (CUP)
85  LEMON JUICE (TBS)
86  SAFFLOWER OIL (TBS)
87  SESAME SEEDS (2 TBS)
88  WHEAT GERM (TBS)
89  TOMATO CATSUP (TBS)
90  HORSERADISH (TSP)
91  RUSSIAN DRESSING (TBS)
92  TAMARI (TBS)
93  BREWER'S YEAST (TBS)
94  HAMBURGER ROLL
95  GROUND MEAT (LB.)
96  LETTUCE
97  TOMATO
98  LIVER (LB.)
99  ONION
100 CARROT
101 CABBAGE (SMALL)
102 MAYONAISSE (TBS)
103 ENDIVE
104 BACON DRESSING
105 APPLE CIDER VINEGAR
106 WATERCRESS (BUNCH)
107 BLUE CHEESE (OZ.)
108 CUCUMBER
109 ROMAINE
110 AVOCADO
111 MACARONI (OZ.)
112 CHEDDAR CHEESE (OZ.)
113 FLOUR (CUP)
114 SALT (TSP)
115 PAPRIKA (TSP)
116 EGG
117 LOBSTER (LB.)
118 SHERRY (CUP)
119 NUTMEG(TSP)
120 BREAD CRUMBS (TBS)
121 BEEF BROTH (CUP)
```

clude the following: Changing the nutrient composition of an existing menu item, replacing an existing item with a new item, adding items to the table, changing either Phase I or Phase II standards.

To change the nutrient composition of an existing item, simply replace one data statement.

The format of the data statement is as follows: "Data" item #, calories, protein (G), fats (G), carbohydrates (G), calcium (MG.), iron (MG.), sodium (MG.), vitamin A (IU), vitamin B (index 1 - 10), vitamin C (MG.), vitamin D (IU), vitamin E (MG.).

There must be a data entry in each of the above categories. If the information is unknown, or very low, use zero. Most of our information is from Nutrition Almanac, by Nutrition Search, Inc., McGraw-Hill Paperbacks, Copyright 1973, 1975 by John D. Kirschmann.

Note that the information in the data statement must be correct for the amount of the appropriate food mentioned in its name.

For example, in our program, serving size of brown rice is specified as 3/4 cup. Therefore, the nutritional data must be for ¾ cup of brown rice.

To replace an existing menu item means replacing one DATA statement, one PRINT statement, and one REM statement.

For example, let's replace Steamed Beet Greens, item 29, with Steamed Beets. First, we replace the current DATA statement, line 9290 with the information for beets:

9290 DATA 29, 53, 1.8, .2, 12, 23, .83, 71, 33, 5, 9.9, 0, 0

Now correct the REM statement describing the data in line 9290.

9285 REM *** 29. Steamed Beets (3240).

Finally, replace line 3240, where the name of item 29 is stored, with the new name:

3240 PRINT "Steamed Beets (cup)"; : RETURN

To add menu items to the table, here is the procedure: Put the new items at the end of the existing table, after item 93 and *before* the end-of-table marker.

To do this, write a new data statement as explained earlier, starting with item #74. Names of additional items must be put in lines following line 3700. Also, you must add line numbers of the new names to the end of line 3045.

To change Phase I standards, change the numbers as appropriate in lines 360-470. For example, to set the minimum standard for vitamin C to 100 mg.: put

450 IF N (10) < 100 THEN FF=1: PRINT "vitamin C" = GO TO 500

To change Phase II standards, change lines 870-995 as appropriate. □

Sample Run

```
MENU PLANNER
HOW MANY DAYS OF MENUS ? 7
WANT A LISTING OF MENU ITEMS AND NUMBERS? N
MAXIMUM DINNER CALORIES? 1300
HOW MANY PEOPLE WILL BE EATING  DINNER? 4
WANT TO SUPRESS COURSE ITEMS LISTINGS? Y
PROTEIN


DAY # 1
 1.SAUTEED CALFS LIVER & ONIONS (1/4 LB.)
 2.CANTALOUPE (1/4)
 3.SUMMER SQUASH (CUP)
 4.NONE
 5.SEEDLESS GRAPES (CUP)
 6.COLA (CUP)
CALORIES- 544   PRO(G)- 37
FATS(G)- 15.5   CARB(G)- 67.4
CAL(MG)- 94.8   I(MG)- 17.8
SOD(MG)- 214.9  A(IU)- 41353
B(INDEX)= 14    C(MG)- 57
D(IU)- 0        E(MG)- 0
IS THIS DAY'S MENU OK? N
WHICH COURSE TO CHANGE? 6


WHAT IS THE NEW ITEM #? 67


DAY # 1
 1.SAUTEED CALFS LIVER & ONIONS (1/4 LB.)
 2.CANTALOUPE (1/4)
 3.SUMMER SQUASH (CUP)
 4.NONE
 5.SEEDLESS GRAPES (CUP)
 6.COFFEE (CUP)
CALORIES- 594   PRO(G)- 43.3
FATS(G)- 31.5   CARB(G)- 56.8
CAL(MG)- 211.6  I(MG)- 7.16
SOD(MG)- 383.1  A(IU)- 19637
B(INDEX)= 24    C(MG)- 1958
D(IU)- 0        E(MG)- 0
IS THIS DAY'S MENU OK? Y

WANT TO MAKE ANY MENU CHANGES? Y
WHICH DAY'S MENU DO YOU WANT TO CHANGE? 1


MENU FOR DAY 1
 1.SAUTEED CALFS LIVER & ONIONS (1/4 LB.)
 2.CANTALOUPE (1/4)
 3.SUMMER SQUASH (CUP)
 4.STEAMED BEET GREENS (CUP)
 5.NONE
 6.TEA (CUP)
 7.NONE
 8.NONE
 9.NONE
COURSE # TO CHANGE-(TYPE 0 IF MENU IS OK)? 5


WHAT IS THE NEW ITEM #? 87


MENU FOR DAY 1
 1.SAUTEED CALFS LIVER & ONIONS (1/4 LB.)
 2.CANTALOUPE (1/4)
 3.SUMMER SQUASH (CUP)
 4.STEAMED BEET GREENS (CUP)
```

Sample Run Continued

```
 7.LEMON JUICE (TBS)
 8.SAFFLOWER OIL (TBS)
 9.WHEAT GERM (TBS)
COURSE # TO CHANGE-(TYPE 0 IF MENU IS OK)? 0

WANT TO MAKE ANY MENU CHANGES? N


(PROTEIN LOW) I SUGGEST YOU ADD MORE CHEESE
TO YOUR DIET.

(CALCIUM LOW) I SUGGEST YOU ADD BREWER'S
YEAST, CHOPPED PARSLEY, CITRUS FRUIT, L
IVER, CORNBREAD, OR DAIRY FOOD TO YOUR DIET.

(SODIUM LOW) I SUGGEST YOU ADD DAIRY FOOD,
STEAMED BEET GREENS, OR SOUPS TO YOU
R DIET.

WANT TO MAKE ANY MENU CHANGES? N
WANT PRINTOUT OF DAILY NUTRIENT ANALYSIS? Y
CALORIES- 620.214
PROTEIN (GRAMS) 34.3229
FAT (GRAMS) 30.6157
CARBOHYDRATES (GRAMS) 58.3214
CALCIUM (MILLIGRAMS) 377.117
IRON (MILLIGRAMS) 8.61714
SODIUM (MILLIGRAMS) 776.757
VITAMIN A (IU'S) 11939.3
VITAMIN B (INDEX) 31.4286
VITAMIN C (MILLIGRAMS) 354.273
VITAMIN D (IU'S) 2.47143
VITAMIN E (MILLIGRAMS) 7.04714

WANT TO MAKE MENU CHANGES? N

WANT COMPLETE MENU PRINTOUT? Y


DAY # 1
 1.SAUTEED CALFS LIVER & ONIONS (1/4 LB.)
 2.CANTALOUPE (1/4)
 3.SUMMER SQUASH (CUP)
 4.STEAMED BEET GREENS (CUP)
 5.SESAME SEEDS (2 TBS)
 6.TEA (CUP)
 7.WHEAT GERM (TBS)
 8.CHOPPED PARSLEY (1/2 CUP)
 9.SAFFLOWER OIL (TBS)


DAY # 2
 1.WATERCRESS WITH BLUE CHEESE
 2.CHICKEN BROTH (CUP)
 3.STEAMED BROCOLLI (CUP)
 4.BAKED POTATO
 6.COFFEE (CUP)
 7.LEMON JUICE (TBS)
 8.SAFFLOWER OIL (TBS)
 9.WHEAT GERM (TBS)


WEEKLY SHOPPING LIST
FOR DINNERS SPECIFIED
CHEESE & TOMATO PIZZA (1/4)    4
BROILED SALMON (1/4 LB.)    4
ROASTED WHITE TURKEY(1/4 LB)    4
CHICKEN BROTH (CUP)    4
FRUIT SALAD (CUP)    4
CANTALOUPE (1/4)    4
ARTICHOKE    4
GREEN BEANS (CUP)    4
STEAMED BEET GREENS (CUP)    4
STEAMED BROCOLLI (CUP)    4
```

Program Listing

```
5 REM *** MENUPLAN PROGRAM
7 REM *** BY CAROLYN BUSCH AND SAM NEWHOUSE
9 REM *** COPYRIGHT (C) 1978 BY SAM NEWHOUSE
10 REM *** MENUPLAN PROGRAM V1
15 REM *** M(7,9) IS MENU MATRIX
17 REM *** N(15) IS NUTRIENTS MATRIX
18 REM *** D(12) IS TEMPORARY NUTRIENT MATRIX
19 REM *** S(121) IS SHOPPING LIST
20 DIM M(7,9),N(15),S(121),D(12)
30 PRINTCHR$(16);CHR$(22);
40 PRINT"MENU PLANNER"
50 D=7:INPUT"HOW MANY DAYS OF MENUS ";D
60 IF D(1ORD)7 THEN PRINT"I CAN PRODUCE FROM 1 TO 7 DAYS OF
MENUS.":GOTO50
65 INPUT"WANT A LISTING OF MENU ITEMS AND NUMBERS";YN$:IF LE
FT$(YN$,1)="Y" THEN PRINT:PRINT:PRINT"MENU ITEMS":PRINT:PRIN
T:FORI=1 TO 121:PRINTI;TAB(5);:IT=I:GOSUB 3000:PRINT:NEXT I:
PRINT:PRINT:PRINT
70 INPUT"MAXIMUM DINNER CALORIES";C
72 INPUT"HOW MANY PEOPLE WILL BE EATING  DINNER";PE
74 INPUT"WANT TO SUPRESS COURSE ITEMS LISTINGS";YN$:IF LEFT$
(YN$,1)="Y" THEN NL=1
75 REM *** CHOOSE A MENU
80 FORI=1 TOD
90 FORF=1 TO 6
95 TF=INT(RND(1)*13)
97 IF TF=0 THEN M(I,F)=0:GOTO110
99 M(I,F)=TF+((F-1)*12)
110 NEXTF
120 NEXT I
130 REM *** NOW A TRIAL SET OF MENUS HAS BEEN PRODUCED
140 REM *** EVALUATE
150 REM *** CLEAR NUTRIENT MATRIX
160 FORI=1TO12:N(I)=0:NEXTI
170 REM *** ADD UP NUTRIENTS OF MENUS
180 FORI=1 TO D
190 RESTORE
200 FOR F=1 TO 6
210 IF M(I,F)=0 THEN 280
```

```
220 READ IT:IF IT =-99 THEN RESTORE:GOTO220
230 IF IT<>M(I,F) THEN GOSUB 2000:GOTO220:REM SKIP ENTRY
240 REM *** NOW AT CORRECT NUTRIENT INFO
250 FORN=1 TO 12
260 READ NC:N(N)=N(N)+NC
270 NEXT N
280 NEXT F
290 NEXTI
300 REM *** NOW SUBTOTALS CONTAIN TOTAL NUTRIENTS IN THE MEN
US SELECTED
310 REM *** GET AVERAGE DAILY NUTRIENTS
320 FORI=1 TO 12
330 N(I)=N(I)/D
340 NEXT I
350 REM *** EVALUATE NUTRIENTS IN TRIAL SET OF MENUS
355 REM *** TEST FOR CALORIES(1)
360 IF N(1))(C-200) THEN FF=1:PRINT"CALORIES":GOTO500
365 REM *** TEST FOR PROTEIN(2)
370 IF N(2)(30 THEN FF=1:PRINT"PROTEIN":GOTO500
375 REM *** TEST FOR FATS(3)
380 IF N(3))100 THEN FF=1:PRINT"FATS":GOTO500
385 REM *** TEST FOR CARBOHYDRATES(4)
390 IF N(4)(40 OR N(4))100 THEN FF=1:PRINT"CARBOHYDRATES":GO
TO500
395 REM *** TEST FOR CALCIUM(5)
400 IF N(5)(150 THEN FF=1:PRINT"CALCIUM":GOTO500
405 REM *** TEST FOR IRON(6)
410 IF N(6)(5 THEN FF=1:PRINT"IRON":GOTO500
415 REM *** TEST FOR SODIUM(7)
420 IF N(7)(600  THEN FF=1:PRINT"SODIUM":GOTO500
425 REM *** TEST FOR VITAMIN A(8)
430 IF N(8)(2000 THEN FF=1:PRINT"VITAMIN A":GOTO500
435 REM *** TEST FOR VITAMIN B
440 IF N(9)(15 THEN FF=1:PRINT"VITAMIN B":GOTO500
445 REM *** TEST FOR VITAMIN C
450 IF N(10)(40 THEN FF=1:PRINT"VITAMIN C":GOTO500
455 REM *** TEST FOR VITAMIN D
460 REM *** NO INITIAL TEST
465 REM *** TEST FOR VITAMIN E
470 REM *** NO INITIAL TEST
500 IF FF=1 THEN FF=0:GOTO80
510 REM *** END OF EVALUATION SECTION
520 REM *** DISPLAY MENUS
530 FORI=1TO12:D(I)=0:NEXTI:RESTORE:FORI=1 TO D
535 PRINT:PRINT:RESTORE:PRINT CHR$(16);CHR$(22);"DAY #";I
540 FORF=1 TO 6
550 IT=M(I,F):IF IT=0 THEN PRINT STR$(F);".";"NONE":GOTO 570
552 READ Z2:IF Z2=-99 THEN RESTORE:GOTO552
553 IF Z2<>IT THEN GOSUB 2000:GOTO552
554 FORDD=1 TO 12:READ NC:D(DD)=D(DD)+NC:NEXTDD
560 PRINTSTR$(  F);".";:GOSUB 3000:PRINT:REM PRINT INGREDIEN
T NAME
570 NEXT F
582 PRINT"CALORIES-";D(1);TAB(16);"PRO(G)-";D(2)
584 PRINT"FATS(G)-";D(3);TAB(16);"CARB(G)-";D(4)
585 PRINT"CAL(MG)-";D(5);TAB(16);"I(MG)-";D(6)
586 PRINT"SOD(MG)-";D(7);TAB(16);"A(IU)-";D(8)
587 PRINT"B(INDEX)=";D(9);TAB(16);"C(MG)-";D(10)
588 PRINT"D(IU)-";D(11);TAB(16);"E(MG)-";D(12)
590 INPUT"IS THIS DAY'S MENU OK";YN$
600 IF LEFT$(YN$,1)="Y" THEN 700
605 FORDD=1 TO 12:D(DD)=0:NEXTDD:RESTORE
610 INPUT"WHICH COURSE TO CHANG  ";CN
620 IF CN<1 OR CN>6 THEN PRINT"PLEASE USE COURSE NUMBERS BET
WEEN 1 AND 6.":GOTO610
622 PRINT:PRINT:PRINTCHR$(16);CHR$(22);:IF NL=1 THEN 630
623 ON CN GOSUB 5900,5910,5920,5930,5940,5950,5955,5960,5965
:IF CN>6 THEN 625
624 FOR DD=((CN-1)*12)+1 TO ((CN-1)*12)+12:GOTO 626
625 FOR DD=72+((CN-7)*7)+1 TO 72+((CN-7)*7)+7
626 PRINTSTR$(DD);".";:IT=DD:GOSUB3000:PRINT
628 NEXT DD
630 INPUT"WHAT IS THE NEW ITEM #";NI
635 IF CF=1 THEN CF=0:M(DC,CN)=NI:GOTO1040
640 M(I,CN)=NI
650 GOTO 535:REM DISPLAY UPDATED MENU
700 FORDD=1TO12:D(DD)=0:NEXTDD:NEXT I
705 GOTO1000
710 REM *** AT THIS POINT, MENUS HAVE BEEN CORRECTED AND APP
ROVED BY USER
720 REM *** EVALUATE AND COMMENT IF NECCESARY
730 REM *** CLEAR NUTRIENT SUB=TOTALS
740 FOR I= 1 TO 12:N(I)=0:NEXTI
750 FORI=1 TO D
755 RESTORE
760 FORF=1 TO 9
762 IF M(I,F)=0 THEN 820
780 READ IT:IF IT=-99 THEN RESTORE:GOTO780
790 IF IT<>M(I,F) THEN GOSUB 2000:GOTO780:REM SKIP ENTRY
800 REM *** NOW AT CORRECT NUTRIENT INFO
810 FORN=1 TO 12:READ NC:N(N)=N(N)+NC:NEXTN
820 NEXTF
830 NEXTI
840 REM *** GET DAILY AVERAGE NUTRIENTS
850 FORI=1 TO 12:N(I)=N(I)/D:NEXTI
860 REM *** EVALUATION AND COMMENTS SECTION
862 PRINT:PRINT:PRINTCHR$(16);CHR$(22);
865 REM *** CALORIES TEST
870 IF N(1)>C THENPRINT"AVERAGE DAILY CALORIE CONTENT IS ";N
(1)-C;" MORE THAN YOU REQUESTED.":PRINT
875 REM *** PROTEIN TEST
880 IF N(2)(40 THEN PRINT"(PROTEIN LOW) I SUGGEST YOU ADD MO
RE CHEESE TO YOUR DIET.":PRINT
885 IF N(2))80 THEN PRINT"(PROTEIN HIGH) I SUGGEST YOU REDUC
E DAIRY FOOD,MEAT,OR FISH IN YOUR DIET.":PRINT
890 REM *** FATS TEST
895 IF N(3)(25 THEN PRINT"(FATS LOW) I SUGGEST YOU ADD SOME
SAFFLOWER OIL,BUTTER, OR SESAME SEEDS TO YOU DIET.":PRINT
900 IF N(3))50 THEN PRINT"(FATS HIGH) I SUGGEST YOU CUT DOWN
 ON MEAT AND DAIRY FOODS.":PRINT
905 REM *** CARBOHYDRATE TEST
910 IF N(4)(30 THEN PRINT"(CARBOHYDRATES LOW) I SUGGEST YOU
ADD RAISINS, NUTS, BROWN RICE,OR BULGAR WHEAT TO YOUR DIET."
:PRINT
915 IF N(4))70 THEN PRINT"(CARBOHYDRATES HIGH) I SUGGEST YOU
 CUT DOWN ON BREADS AND DESERTS.":PRINT
920 REM *** CALCIUM TEST
925 IF N(5)(500 THEN PRINT"(CALCIUM LOW) I SUGGEST YOU ADD B
REWER'S YEAST, CHOPPED PARSLEY, CITRUS FRUIT, LIVER, CORNBRE
AD, OR DAIRY FOOD TO YOUR DIET.":PRINT
930 REM *** IRON TEST
935 IF N(6)(8 THEN PRINT"(IRON LOW) I SUGGEST YOU ADD EGGS,
FISH, LIVER, POULTRY, WHEAT GERM, RAISINS, OR PARSLEY TO YOU
R DIET.":PRINT
940 REM *** SODIUM TEST
945 IF N(7)(800 THEN PRINT"(SODIUM LOW) I SUGGEST YOU ADD DA
IRY FOOD,  STEAMED BEET GREENS, OR SOUPS TO YOUR DIET.":PRIN
T
950 IF N(7))5000 THEN PRINT"(SODIUM HIGH) I SUGGEST YOU CUT
DOWN TABLE SALT USE, SOUPS, DAIRY FOODS, OR BROWN RICE.":PRI
NT
955 REM *** VITAMIN A TEST
960 IF N(8)(5000 THEN PRINT"(VITAMIN A LOW) I SUGGEST YOU AD
D SPINACH, CARROTS, LIVER, SUMMER SQUASH, GREEN VEGETABLES,
OR ORANGES TO YOUR DIET.":PRINT
965 REM *** VITAMIN B TEST
970 IF N(9)(20 THEN PRINT"(VITAMIN B LOW) I SUGGEST YOU ADD
WHOLE GRAINS, BREWER'S YEAST, GREEN VEGETABLES, DAIRY FOODS,
 LIVER, WHEAT GERM, SALMON, CHICKEN, AND/OR SEEDS TO YOUR DI
ET.":PRINT
975 REM *** VITAMIN C TEST
980 IF N(10)(250 THEN PRINT"(VITAMIN C LOW) I SUGGEST YOU AD
D CITRUS FRUIT, CANTALOUPE, BROCCOLI, PARSLEY, OR COLE SLAW
TO YOUR DIET.":PRINT
985 REM *** VITAMIN D TEST
990 IF N(11)(00 THEN PRINT"(VITAMIN D LOW) I SUGGEST YOU ADD
 LIVER, SALMON, FISH LIVER OIL, AND/OR EGGS TO YOUR DIET. NO
TE-VITAMIN D CANNOT BE ABSORBED PROPERLY WITHOUT ADEQUATE CA
LCIUM.":PRINT
995 IF N(12)(00 THEN PRINT"(VITAMIN E LOW) I SUGGEST YOU ADD
 WHEAT GERM, SAFFLOWER OIL, SALADS, RAW GREEN VEGETABLES, SE
SAME SEEDS, FISH, AND/OR WHOLE GRAINS TO YOUR DIET.":PRINT
```

```
997 PRINT:INPUT"WANT TO MAKE ANY MENU CHANGES";YN$:IFLEFT$(Y
N$,1)="Y" THEN1020 ELSE8000
1000 PRINT:INPUT"WANT TO MAKE ANY MENU CHANGES";YN$
1010 IF LEFT$(YN$,1)="N" THEN 710:REM- ENDING PRINTOUT
1020 INPUT"WHICH DAY'S MENU DO YOU WANT TO CHANGE";DC
1030 IF DC<1 OR DC>D THEN PRINT"USE DAY NUMBERS 1 THROUGH ";
D;".":GOTO1020
1040 PRINT:PRINT:PRINTCHR$(16);CHR$(22);"MENU FOR DAY";DC
1050 FOR F=1 TO 9
1055 IF M(DC,F)=0 THEN PRINTSTR$(F);".NONE":GOTO1070
1060 IT=M(DC,F):PRINTSTR$(F);".";:GOSUB 3000:PRINT
1070 NEXT F
1080 INPUT"COURSE # TO CHANGE-(TYPE 0 IF MENU IS OK)";CN
1090 IF CN=0 THEN 1000
1100 IF CN<0 OR CN>9 THEN PRINT"USE COURSE NUMBERS 1-9.":GOT
O1080
1110 CF=1:GOTO622
2000 FOR DD=1 TO 12:READ A$:NEXTDD:RETURN
3000 REM *** PRINT MENU ITEM NAME
3010 IF IT>30 THEN 3020
3015 ON IT GOSUB  3100,3105,3110,3115,3120,3125,3130,3135,31
40,3145,3150,3155,3160,3165,3170,3175,3180,3185,3190,3195,32
00,3205,3210,3215,3220,3225,3230,3235,3240,3245:RETURN
3020 TT=IT-30:IF TT>30 THEN 3030
3025 ON TT GOSUB 3250,3255,3260,3265,3270,3275,3280,3285,329
0,3295,3300,3305,3310,3315,3320,3325,3330,3335,3340,3345,335
0,3355,3360,3365,3370,3375,3380,3385,3390,3395:RETURN
3030 TT=IT-60:IF TT>33 THEN 3040
3035 ON TT GOSUB 3400,3405,3410,3415,3420,3425,3430,3435,344
0,3445,3450,3455,3460,3465,3470,3475,3480,3485,3490,3495,350
0,3505,3510,3515,3520,3525,3530,3535,3540,3545,3550,3555,356
0:RETURN
3040 TT=IT-93
3045 ON TT GOSUB 3565,3570,3575,3580,3585,3590,3595,3600,360
5,3610,3615,3620,3625,3630,3635,3640,3645,3650,3655,3660,366
5,3670,3675,3680,3685,3690,3695,3700:RETURN
3100 PRINT"MACARONI & CHEESE (CUP)";:RETURN
3105 PRINT"CHEESE & TOMATO PIZZA (1/4)";:RETURN
3110 PRINT"CHEESE SOUFFLE (1/4 LB.)";:RETURN
3115 PRINT"SAUTEED CALFS LIVER & ONIONS (1/4 LB.)";:RETURN
3120 PRINT"BAKED FLOUNDER (1/4 LB.)";:RETURN
3125 PRINT"FRIED HADDOCK (1/4 LB.)";:RETURN
3130 PRINT"LOBSTER NEWBURG (100 G.)";:RETURN
3135 PRINT"BROILED SALMON (1/4 LB.)";:RETURN
3140 PRINT"MEAT LOAF (1/4 LB.)";:RETURN
3145 PRINT"HAMBURGER WITH ROLL,LETTUCE, TOMATO, CATSUP";:RET
URN
3150 PRINT"ROASTED WHITE TURKEY(1/4 LB)";:RETURN
3155 PRINT"BROILED CHICKEN (1/2 LB)";:RETURN
3160 PRINT"COLE SLAW (CUP)";:RETURN
3165 PRINT"LETTUCE, TOMATO, AND MAYONNAISE SALAD (CUP)";:RET
URN
3170 PRINT"ENDIVE WITH BACON DRESSING";:RETURN
3175 PRINT"TOMATO & ONION WITH CIDER VINEGAR AND OIL";:RETUR
N
3180 PRINT"WATERCRESS WITH BLUE CHEESE";:RETURN
3185 PRINT"CUCUMBER WITH CREME AND CIDER VINEGAR (CUP)";:RET
URN
3190 PRINT"AVOCADO WITH TOMATOES AND ROMAINE";:RETURN
3195 PRINT"CHICKEN BROTH (CUP)";:RETURN
3200 PRINT"CREME OF ASPARAGUS SOUP(CUP)";:RETURN
3205 PRINT"SPLIT PEA SOUP (CUP)";:RETURN
3210 PRINT"FRUIT SALAD (CUP)";:RETURN
3215 PRINT"CANTALOUPE (1/4)";:RETURN
3220 PRINT"ARTICHOKE";:RETURN
3225 PRINT"ASPARAGUS (6 SPEARS)";:RETURN
3230 PRINT"GREEN BEANS (CUP)";:RETURN
3235 PRINT"CABBAGE (CUP)";:RETURN
3240 PRINT"STEAMED BEET GREENS (CUP)";:RETURN
3245 PRINT"STEAMED BROCOLLI (CUP)";:RETURN
3250 PRINT"STEAMED BRUSSEL SPROUTS(CUP)";:RETURN
3255 PRINT"SUMMER SQUASH (CUP)";:RETURN
3260 PRINT"CARROTS (CUP)";:RETURN
3265 PRINT"CAULIFLOWER (CUP)";:RETURN
3270 PRINT"BAKED POTATO";:RETURN
3275 PRINT"PEAS & ONIONS (CUP)";:RETURN
3280 PRINT"CORNBREAD (50 G.)";:RETURN
3285 PRINT"CRACKED WHEAT BREAD(SLICE)";:RETURN
3290 PRINT"FRENCH BREAD (SLICE)";:RETURN
3295 PRINT"ITALIAN BREAD (SLICE)";:RETURN
3300 PRINT"PUMPERNICKEL (SLICE)";:RETURN
3305 PRINT"BREAD STUFFING (CUP)";:RETURN
3310 PRINT"RYE CRACKER";:RETURN
3315 PRINT"BROWN RICE (3/4 CUP)";:RETURN
3320 PRINT"WHITE RICE (3/4 CUP)";:RETURN
3325 PRINT"CORN TORTILLA";:RETURN
3330 PRINT"BULGAR WHEAT (CUP)";:RETURN
3335 PRINT"NONE";:RETURN
3340 PRINT"DANISH PASTRY";:RETURN
3345 PRINT"VANILLA ICE CREAM (CUP)";:RETURN
3350 PRINT"BANANNA BREAD (SLICE)";:RETURN
3355 PRINT"GINGER BREAD (SLICE)";:RETURN
3360 PRINT"CHOCOLATE CHIP COOKIE";:RETURN
3365 PRINT"DATE NUT COOKIE";:RETURN
3370 PRINT"BLUEBERRY PIE (SLICE)";:RETURN
3375 PRINT"PECAN PIE (SLICE)";:RETURN
3380 PRINT"APPLE";:RETURN
3385 PRINT"ORANGE";:RETURN
3390 PRINT"SEEDLESS GRAPES (CUP)";:RETURN
3395 PRINT"DRIED FIG (1 LG.)";:RETURN
3400 PRINT"BEER (CUP)";:RETURN
3405 PRINT"WHITE WINE (CUP)";:RETURN
3410 PRINT"LIQUOR (1.5 OZ.)";:RETURN
3415 PRINT"CORDIAL (1.5 OZ.)";:RETURN
3420 PRINT"COCKTAIL JUICE (CUP)";:RETURN
3425 PRINT"COFFEE (CUP)";:RETURN
3430 PRINT"TEA (CUP)";:RETURN
3435 PRINT"COLA (CUP)";:RETURN
3440 PRINT"UNSWEETENED APPLE JUICE(CUP)";:RETURN
3445 PRINT"ORANGE JUICE (CUP)";:RETURN
3450 PRINT"WATER";:RETURN
3455 PRINT"GRAPE JUICE (CUP)";:RETURN
3460 PRINT"YOGURT (1/2 CUP)";:RETURN
3465 PRINT"PARMESAN CHEESE (1 OZ.)";:RETURN
3470 PRINT"SWISS CHEESE (1 OZ.)";:RETURN
3475 PRINT"HALF & HALF (TBS)";:RETURN
3480 PRINT"HOLLANDAISE SAUCE (TBS)";:RETURN
3485 PRINT"BUTTER (TBS)";:RETURN
3490 PRINT"COTTAGE CHEESE (1/2 CUP)";:RETURN
3495 PRINT"HONEY (TBS)";:RETURN
3500 PRINT"LIME JUICE (TBS)";:RETURN
3505 PRINT"CHOPPED PARSLEY (1/2 CUP)";:RETURN
3510 PRINT"RAISINS (1/4 CUP)";:RETURN
3515 PRINT"POPCORN (CUP)";:RETURN
3520 PRINT"LEMON JUICE (TBS)";:RETURN
3525 PRINT"SAFFLOWER OIL (TBS)";:RETURN
3530 PRINT"SESAME SEEDS (2 TBS)";:RETURN
3535 PRINT"WHEAT GERM (TBS)";:RETURN
3540 PRINT"TOMATO CATSUP (TBS)";:RETURN
3545 PRINT"HORSERADISH (TSP)";:RETURN
3550 PRINT"RUSSIAN DRESSING (TBS)";:RETURN
3555 PRINT"TAMARI (TBS)";:RETURN
3560 PRINT"BREWER'S YEAST (TBS)";:RETURN
3565 PRINT"HAMBURGER ROLL";:RETURN
3570 PRINT"GROUND MEAT (LB.)";:RETURN
3575 PRINT"LETTUCE";:RETURN
3580 PRINT"TOMATO";:RETURN
3585 PRINT"LIVER (LB.)";:RETURN
3590 PRINT"ONION";:RETURN
3595 PRINT"CARROT";:RETURN
3600 PRINT"CABBAGE (SMALL)";:RETURN
3605 PRINT"MAYONAISSE (TBS)";:RETURN
3610 PRINT"ENDIVE";:RETURN
3615 PRINT"BACON DRESSING";:RETURN
3620 PRINT"APPLE CIDER VINEGAR";:RETURN
3625 PRINT"WATERCRESS (BUNCH)";:RETURN
3630 PRINT"BLUE CHEESE (OZ.)";:RETURN
3635 PRINT"CUCUMBER";:RETURN
3640 PRINT"ROMAINE";:RETURN
3645 PRINT"AVOCADO";:RETURN
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3650 PRINT"MACARONI (OZ.)";:RETURN
3655 PRINT"CHEDDAR CHEESE (OZ.)";:RETURN
3660 PRINT"FLOUR (CUP)";:RETURN
3665 PRINT"SALT (TSP)";:RETURN
3670 PRINT"PAPRIKA (TSP)";:RETURN
3675 PRINT"EGG";:RETURN
3680 PRINT"LOBSTER (LB.)";:RETURN
3685 PRINT"SHERRY (CUP)";:RETURN
3690 PRINT"NUTMEG(TSP)";:RETURN
3695 PRINT"BREAD CRUMBS (TBS)";:RETURN
3700 PRINT"BEEF BROTH (CUP)";:RETURN
5900 PRINT"MAIN COURSES":RETURN
5910 PRINT"APPETIZERS":RETURN
5920 PRINT"VEGETABLES":RETURN
5930 PRINT"GRAINS":RETURN
5940 PRINT"DESERTS":RETURN
5950 PRINT"BEVERAGES":RETURN
5955 PRINT"DAIRY":RETURN
5960 PRINT"CONDIMENTS":RETURN
5965 PRINT"FOOD SUPPLEMENTS":RETURN
6900 PRINT"CALORIES-";:RETURN
6910 PRINT"PROTEIN (GRAMS)";:RETURN
6920 PRINT"FAT (GRAMS)";:RETURN
6930 PRINT"CARBOHYDRATES (GRAMS)";:RETURN
6940 PRINT"CALCIUM (MILLIGRAMS)";:RETURN
6950 PRINT"IRON (MILLIGRAMS)";:RETURN
6955 PRINT"SODIUM (MILLIGRAMS)";:RETURN
6960 PRINT"VITAMIN A (IU'S)";:RETURN
6965 PRINT"VITAMIN B (INDEX)";:RETURN
6970 PRINT"VITAMIN C (MILLIGRAMS)";:RETURN
6975 PRINT"VITAMIN D (IU'S)";:RETURN
6980 PRINT"VITAMIN E (MILLIGRAMS)";:RETURN
7000 FORGG=1TOPE:S(111)=S(111)+2:S(112)=S(112)+.5:S(76)=S(76
)+1:S(78)=S(78)+.5:S(74)=S(74)+.5:NEXTGG:RETURN
7005 FORGG=1TOPE:S(78)=S(78)+2:S(113)=S(113)+.125:S(114)=S(1
14)+.5:S(115)=S(115)+.5:S(76)=S(76)+.5:S(112)=S(112)+2:S(116
)=S(116)+2:NEXTGG:RETURN
7010 FORGG=1TOPE:S(98)=S(98)+.25:S(99)=S(99)+.5:NEXTGG:RETUR
N
7015 FORGG=1TOPE:S(78)=S(78)+1:S(117)=S(117)+.5:S(118)=S(118
)+.125:S(115)=S(115)+.125:S(119)=S(119)+.125:S(116)=S(116)+1
:S(76)=S(76)+.25:NEXTGG:RETURN
7020 FORGG=1TOPE:S(95)=S(95)+.25:S(116)=S(116)+.5:S(82)=S(82
)+.5:S(86)=S(86)+.25:S(120)=S(120)+1:S(121)=S(121)+.5:NEXTGG
:RETURN
7025 FORGG=1TOPE:S(94)=S(94)+1:S(95)=S(95)+.25:S(96)=S(96)+(
1/16):S(97)=S(97)+.25:S(89)=S(89)+1:NEXTGG:RETURN
7030 FORGG=1 TO PE:S(100)=S(100)+1:S(101)=S(101)+.25:S(102)=
S(102)+1:NEXTGG:RETURN
7035 FORGG=1TOPE:S(96)=S(96)+.25:S(97)=S(97)+.5:S(102)=S(102
)+1:NEXTGG:RETURN
7040 FORGG=1TOPE:S(103)=S(103)+.25:S(104)=S(104)+1:NEXT GG:R
ETURN
7045 FORGG=1TOPE:S(99)=S(99)+.25:S(97)=S(97)+.75:S(82)=S(82)
+(1/16):S(105)=S(105)+1:S(86)=S(86)+1:S(92)=S(92)+.125:NEXTG
G:RETURN
7050 FORGG=1TOPE:S(106)=S(106)+.5:S(107)=S(107)+.5:S(73)=S(7
3)+.25:NEXTGG:RETURN
7055 FORGG=1TOPE:S(108)=S(108) +.5:S(76)=S(76)+1:S(105)=S(10
5)+2:NEXTGG:RETURN
7060 FORGG=1 TO PE:S(109)=S(109)+.25:S(97)=S(97)+.5:S(110)=S
(110)+.5:NEXTGG:RETURN
7500 S(IT)=S(IT)+PE:RETURN
8000 REM *** FINAL PRINTOUT
8010 INPUT"WANT PRINTOUT OF DAILY NUTRIENT ANALYSIS";YN$
8020 IF LEFT$(YN$,1)="N" THEN 8162
8030 FORI=1 TO 12:N(I)=0:NEXTI
8040 FORI=1TOD
8045 RESTORE
8050 FORF=1TO9
8052 IF M(I,F)=0 THEN 8095
8060 READ IT:IF IT=-99 THEN RESTORE:GOTO8060
8070 IF IT()M(I,F) THEN GOSUB 2000:GOTO 8060
8080 REM *** NOW AT CORRECT NUTRIENT INFO
8090 FORN=1 TO 12:READ NC:N(N)=N(N)+NC:NEXT N
8095 NEXT F
8097 NEXT I
8100 FORN=1 TO 12:N(N)=N(N)/D:NEXTN
8110 REM *** PRINT OUT DAILY NUTRIENTS ANALYSIS
8120 PRINTCHR$(16);CHR$(22);
8130 FORN=1TO12
8140 ON N GOSUB 6900,6910,6920,6930,6940,6950,6955,6960,6965
,6970,6975,6980:PRINTN(N)
8150 NEXTN
8160 PRINT:INPUT"WANT TO MAKE MENU CHANGES";YN$:IFLEFT$(YN$,
1 )="Y" THEN 1020
8162 PRINT:INPUT"WANT COMPLETE MENU PRINTOUT";YN$
8163 IF LEFT$(YN$,1)()"Y" THEN 8170
8164 PRINT:PRINT:PRINTCHR$(16);CHR$(22);:FOR I=1TOD
8165 PRINT:PRINT:PRINTCHR$(16);CHR$(22);"DAY #";I:RESTORE:FO
R F=1 TO 9
8166 IF M(I,F)=0 THEN PRINTSTR$(F);".NONE":GOTO8168
8167 PRINTSTR$(F);".";:IT=M(I,F):GOSUB 3000:PRINT
8168 NEXTF
8169 NEXTI
8170 PRINT:PRINT:PRINTCHR$(16);CHR$(22);
8180 PRINT"WEEKLY SHOPPING LIST"
8190 PRINT"FOR DINNERS SPECIFIED"
8200 FORI=1 TO D
8205 FORF=1TO9
8207 IF M(I,F)=0 THEN 8240
8209 IT=M(I,F):IF IT >19 THEN 8235
8211 ON IT GOSUB 7000,7500,7005,7010,7500,7500,7015,7500,702
0,7025,7500,7500,7030,7035,7040,7045,7050,7055,7060:GOTO8240
8235 S(IT)=S(IT)+PE
8240 NEXT F
8250 NEXT I
8260 REM *** PRINT SHOPPING LIST
8270 FOR I=1 TO 121
8280 IF S(I)=0 THEN 8300
8290 IT=I:GOSUB3000:PRINT"   ";S(I)
8300 NEXT I
8310 END
9000 REM *** NUTRIENT DATA
9005 REM *** 1. MACARONI & CHEESE (3100)
9010 DATA 1,468,19,24,44,398,2,1194,946,5,0,0,0
9015 REM *** 2. CHEEZE & TOMATO PIZZA (3105)
9020 DATA 2,345,18,12.4,42,332,1.5,1054,946,3,6,0,0
9025 REM *** 3. CHEESE SOUFFLE (3110)
9030 DATA 3,247,11.25,19.4,7,227,1.13,412,906,0,0,0,0
9035 REM *** 4. SAUTEED CALFS LIVER & ONIONS (3115)
9040 DATA 4,296,33.5,15,4.5,14.8,16,133.8,37033,0,0,0,0
9045 REM *** 5. BAKED FLOUNDER (3120)
9050 DATA 5,224,35,9.5,0,26.5,1.61,273,0,3,2.3,0,0
9055 REM *** 6. FRIED HADDOCK (3125)
9060 DATA 6,179,22,7.3,6.5,45,1.4,199,0,3,2.4,0,.45
9065 REM *** 7. LOBSTER NEWBURG (3130)
9070 DATA 7,194,18.5,10.6,5.1,87,.9,229,0,0,0,0,0
9075 REM *** 8. BROILED SALMON (3135)
9080 DATA 8,206,31,8.3,0,0,1.35,131,181,6,0,0,0
9085 REM *** 9. MEAT LOAF (3140)
9090 DATA 9,227,18,15,3.8,10,2.1,539,0,0,0,0,0
9095 REM *** 10. HAMBERGER ON ROLL WITH LETTUCE, TOMATO AND
CATSUP (3145)
9100 DATA 10,454,32,26,21,43,4.8,0,165,3,2,0,0
9105 REM *** 11. ROASTED WHITE TURKEY (3150)
9110 DATA 11,199,37,4.4,0,9,1.7,112,0,6,0,0,0
9115 REM *** 12. BROILED CHICKEN PARTS (3155)
9120 DATA 12,308,54,8.5,0,905,2.45,150,204,8,0,0,.85
9125 REM *** 13. COLE SLAW (3160)
9130 DATA 13,173,1.6,16.8,5.8,34.8,.48,144,192,3,34.8,0,0
9135 REM *** 14. LETTUCE, TOMATO & MAYONAISSE (3165)
9140 DATA 14,104,2,7.6,8.5,26,1,0,40,3,2,0,0
9145 REM *** 15. ENDIVE WITH BACON DRESSING (3170)
9150 DATA 15,288,4.5,21.7,3.8,83,1.9,14,3000,5,11,0,0
9155 REM *** 16. TOMATO & ONION WITH CIDER VINEGAR & OIL (31
75)
9160 DATA 16,50,.86,3.9,6.55,12,.3,276,231.5,3,8,0,3.3
9165 REM *** 17. WATERCRESS WITH BLUE CHEESE DRESSING (3180)
9170 DATA 17,37,1.5,9.1,2.1,85.1,.87,21,187,4,39.8,0,.03
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9175 REM *** 18. CUCUMBER WITH CREME & CIDER VINEGAR (3185)
9180 DATA 18,85,2.8,12,6,96,.6,33,776,5,13.1,0,0
9185 REM *** 19. AVOCADO, TOMATO & ROMAINE SALAD (3190)
9190 DATA 19,213,4.3,18.3,14,91,2.45,16.5,3030,5,1836,0,0
9195 REM *** 20. CHICKEN BROTH (3195)
9200 DATA 20,22,3,.5,1.9,12,1.2,722,0,0,0,0,0
9205 REM *** 21. CREME OF ASPARAGUS SOUP (3200)
9210 DATA 21,152,7.3,6.2,18,188,.8,1046,332,3,0,0,0
9215 REM *** 22. SPLIT PEA SOUP (3205)
9220 DATA 22,148,8.7,3.2,21,30,1.5,966,450,4,4.2,0,0
9225 REM *** 23. FRUIT SALAD (3210)
9230 DATA 23,160,1.4,6.1,31.2,24,.83,0,518,3,6.2,0,0
9235 REM *** 24. CANTALOUPE (3215)
9240 DATA 24,30,.7,.1,7.5,14,.4,12,3400,7,33,0,0
9245 REM *** 25. ARTICHOKE (3220)
9250 DATA 25,44,2.9,.2,10.6,51,1.1,30,150,3,8.5,0,0
9255 REM *** 26. ASPARAGUS (3225)
9260 DATA 26,18,1.8,0,3.6,20,.6,1.2,864,4,25,0,0
9265 REM *** 27. GREEN BEANS (3230)
9270 DATA 27,31,2,.2,8.9,62.5,.75,5,675,7,15,0,0
9275 REM *** CABBAGE (3235)
9280 DATA 28,34,1.9,.3,7.3,75,.5,24,221,5,44,0,0
9285 REM *** 29. STEAMED BEET GREENS (3240)
9290 DATA 29,18,1.7,.2,3.3,94,1.9,76,5100,7,15,0,0
9295 REM *** 30. STEAMED BROCOLLI (3245)
9300 DATA 30,39,4.6,.4,6.7,132,1.2,15,3750,7,135.8,0,0
9305 REM *** 31. STEAMED BRUSSEL SPROUTS (3250)
9310 DATA 31,47,3.5,.5,8.3,42,1.43,1.3,676,7,113,0,0
9315 REM *** 32. SUMMER SQUASH (3255)
9320 DATA 32,28,1.8,.2,6.2,50,.8,2,780,4,20,0,0
9325 REM *** 33. CARROTS (3260)
9330 DATA 33,47,1.3,.3,16.7,47,.9,50,15750,3,9,0,0
9335 REM *** 34. CAULIFLOWER (3265)
9340 DATA 34,26,2.8,.2,4.9,25,.84,10.8,72,3,66,0,0
9345 REM *** 35. BAKED POTATO (3270)
9350 DATA 35,93,2.6,.1,21.1,9,.7,4,0,3,20,0,0
9355 REM *** 36. PEAS & ONIONS (3275)
9360 DATA 36,98,4.4,3.7,13.3,41.7,1.4,51.2,467.3,5,7.3,4.3,0
9365 REM *** 37. CORNBREAD (3280)
9370 DATA 37,104,3.7,3.6,14,60,.55,314,75,3,.5,0,0
9375  REM *** 38. CRACKED WHEAT (3285)
9380 DATA 38,61,2,.1,13,20,.25,122,0,7,0,0,0
9385 REM *** 39. FRENCH BREAD (3290)
9390 DATA 39,58,1.8,.6,11.1,9,.4,116,0,3,0,0,0
9395 REM *** 40. ITALIAN BREAD (3295)
9400 DATA 40,55,1.8,.2,11.3,3,.4,117,0,3,0,0,0
9405 REM *** 41. PUMPERNICKEL (3300)
9410 DATA 41,79,2.9,4,17,27,.8,182,0,3,0,0,0
9415 REM *** 42. BREAD STUFFING (3305)
9420 DATA 42,478,10,29,44,92,2.3,159,0,3,0,0,0
9425 REM *** 43. RYE CRACKER (3310)
9430 DATA 43,13,.2,.7,1.5,1.6,.01,26.5,0,0,0,0,0
9435 REM *** 44. BROWN RICE (3315)
9440 DATA 44,134,2.9,.68,27.8,13.5,.6,317,0,6,0,0,0
9445 REM *** 45. WHITE RICE (3320)
9450 DATA 45,119,2.3,.15,27,11.3,1,12.8,0,0,0,0,0
9455 REM *** 46. CORN TORTILLA (3325)
9460 DATA 46,63,1.5,.6,13.5,0,.9,2.3,6,3,0,0,0
9465 REM *** 47. BULGAR WHEAT (3330)
9470 DATA 47,315,12,1.2,63.4,38,2.4,1124,0,5,0,0,0
9475 REM *** 48. NONE (3335)
9480 DATA 48,0,0,0,0,0,0,0,0,0,0,0
9485 REM *** 49. DANISH PASTRY (3340)
9490 DATA 49,148,2.6,23.5,16,17,.3,128,108,0,0,0,0
9495 REM *** 50. VANILLA ICE CREAM (3345)
9500 DATA 50,389,7.5,24,39,231,.19,75,978,3,.19,0,.11
9505 REM *** 51. BANANNA BREAD (3350)
9510 DATA 51,134,2.4,3.9,23,8,4,0,273,3,0,3,0
9515 REM *** 52. GINGER BREAD (3355)
9520 DATA 52,174,2.1,5.9,28,37,1.3,130,50,0,0,0,0
9525 REM *** 53. CHOCOLATE CHIP COOKIE (3360)
9530 DATA 53,46,.5,2.7,5.3,3.1,.2,31,10,0,0,0,0
9535 REM *** 54. DATE NUT COOKIE (3365)
9540 DATA 54,76,.8,3.5,10,0,0,35,15,0,0,0,0
9545 REM *** 55. BLUEBERRY PIE (3370)
9550 DATA 55,266,2.6,12,37,12,.66,295,33,0,3.3,0,0
9555 REM *** 56. PECAN PIE (3375)
9560 DATA 56,472,5.8,26,58,53,3.2,250,181,0,0,0,0
9565 REM *** 57. APPLE (3380)
9570 DATA 57,76,.3,.8,17,9,.39,1,117,7,5.2,0,.4
9575 REM *** 58. ORANGE (3385)
9580 DATA 58,88,1.8,.4,20,74,.72,1.8,360,7,90,0,.43
9585 REM *** 59. SEEDLESS GRAPES (3390)
9590 DATA 59,102,1,.2,27.2,16,.6,8,140,3,4,0,0
9595 REM *** 60. DRIED FIG (3395)
9600 DATA 60,58,.9,.3,13,26,.63,7.1,17,7,0,0,0
9605 REM *** 61. BEER
9610 DATA 61,101,1.4,0,10.8,10,0,17,0,5,0,0,0
9615 REM *** 62. WHITE WINE
9620 DATA 62,204,.2,0,9.6,22,.96,5,0,4,0,0,0
9625 REM *** 63. LIQUOR
9630 DATA 63,70,0,0,0,0,0,.3,0,0,0,0,0
9635 REM *** 64. CORDIAL
9640 DATA 64,70,0,0,0,0,0,0,0,0,0,0,0
9645 REM *** 65. COCKTAIL JUICE
9650 DATA 65,163,2.5,2.5,40,13,.75,2.5,0,0,40,0,0
9655 REM *** 66. COFFEE
9660 DATA 66,2,.3,.1,.8,4.6,.23,2.3,0,0,0,0,0
9665 REM *** 67. TEA
9670 DATA 67,4,.1,0,.9,5,.2,1.6,0,0,1,0,0
9675 REM *** 68. COLA
9680 DATA 68,88,0,0,22,0,0,59.1,0,0,0,0,0
9685 REM *** 69. UNSWEETENED APPLE JUICE
9690 DATA 69,118,.2,0,30,15,1.5,10,0,5,2.5,0,0
9695 REM *** 70. ORANGE JUICE
9700 DATA 70,75,1.2,2.5,17,20,.88,6.2,0,0,0,0,0
9705 REM *** 71. WATER
9710 DATA 71,0,0,0,0,0,0,0,0,0,0,0,0
9715 REM *** 72. GRAPE JUICE
9720 DATA 72,165,.5,0,41,28,.75,5,0,5,0,0,0
9725 REM *** YOGURT (3460)
9730 DATA 73,112,4.25,2.16,6.5,150,0,64,87,3,1.25,0,0
9735 REM *** PARMESAN CHEESE(3465)
9740 DATA 74,110,10,7.3,.8,320,.1,205,300
9745 REM *** 75. SWISS CHEESE (3470)
9750 DATA 75,99,7.8,7.9,.5,259,.25,199,0
9755 REM *** 76.HALF & HALF (3475)
9760 DATA 76,20,.5,1.8,.7,16.2,0,6.9,72,2
9765 REM *** 77.HOLLANDAISE SAUCE (3480)
9770 DATA 77,48,1,4.1,1.6,22,.18,0,208,0,
9775 REM *** 78.BUTTER (3485)
9780 DATA 78,100,.1,11.2,.1,2.8,0,138,462
9785 REM *** 79.COTTAGE CHEESE (3490)
9790 DATA 79,118,15.5,4.75,3.25,106,.34,2
9795 REM *** 80.HONEY (3495)
9800 DATA 80,64,.1,0,16,1,.11,1.1,0,5,.21
9805 REM *** 81.LIME JUICE (3500)
9810 DATA 81,4,.1,0,1.3,1,.03,0,2,0,3,0,0
9815 REM *** 82.CHOPPED PARSLEY (3505)
9820 DATA 82,12.5,1,.15,2.4,57,1.8,12.5,2
9825 REM *** 83.RAISINS (3510)
9830 DATA 83,116,1,.1,27.8,25,1.4,11,8,4,
9835 REM *** 84.POPCORN (3515)
9840 DATA 84,66,1.4,3.1,8.3,1.1,.31,271,0
9845 REM *** 85.LEMON JUICE (3520)
9850 DATA 85,4,.1,0,1.2,1,.03,.1,3,0,7,0,
9855 REM *** 86.SAFFLOWER OIL (3525)
9860 DATA 86,125,0,14,0,0,0,0,0,0,0,13
9865 REM *** 87.SESAME SEEDS (3530)
9870 DATA 87,35,1.2,3,1.3,73.4,.65,3.7,2,
9875 REM *** 88.WHEATGERM (3535)
9880 DATA 88,24,1.8,.7,2.7,4,.5,.2,0,10,0
9885 REM *** 89.TOMATO CATSUP (3540)
9890 DATA 89,19,.3,.1,4.3,3.7,.14,177,238
9895 REM *** 90.HORSERADISH (3545)
9900 DATA 90,2,.1,0,.5,3,.05,4.8,0,0,0,0,
9905 REM *** 91.RUSSIAN DRESSING (3550)
9910 DATA 91,74,.2,7.6,1.1,2.8,.09,130,10
9915 REM *** 92.TAMARI (3555)
9920 DATA 92,8,.8,1.5,12.3,.72,0,1099,0,0
9925 REM *** 93.BREWER'S YEAST (3560)
9930 DATA 93,28,3.9,.1,3.8,21,1.7,12,0,10
9935 REM *** END OF TABLE MARKER
9940 DATA -99
```

COMPUTER BRIDGE

BY THOMAS A. THROOP

This column on computer bridge appears at frequent intervals in Personal Computing. *If you have a bridge program in your computer, or have played the game against a computer, or if you have any suggestions on writing either a bridge-playing program or a bridge-bidding program, please let us know. Any comments at all on computer bridge are welcome. Address your notes to Computer Bridge,* Personal Computing, *1050 Commonwealth Ave., Boston, MA 02215.*

Bridge, like chess, applies artificial intelligence techniques to a computer program. It provides a game with considerable intellectual and creative content and with a limited set of clearly defined rules.

In the early 1960's only three bridge-playing computer programs existed. The programs were designed only to play the cards. They were unable to participate in the bidding, a function that requires a separate algorithm. The first two operated in a "double dummy" environment where the programs solved bridge problems knowing the specific cards in the four hands. The first program, (author unknown) operated on a Bendix computer and solved only predetermined double dummy problems. In this routine the declarer's plays, in response to alternative defensive plays, were prepared manually and supplied to the program as a data file.

The second program, developed by Elwyn Berlekamp at Massachusetts Institute of Technology in 1962, could do only one thing: solve a 7 no-trump double dummy problem. It could do nothing else.

The third program, written by Gay Carley, also at MIT in 1962, consisted mainly of a large number of subroutines for playing the declarer and dummy cards to a single trick. However, there was no overall strategy for coordinating the play of an entire hand.

In 1968-9 I developed a set of heuristic algorithms for playing, as declarer, the declarer and dummy cards for any randomly dealt hand. My frequent partner in tournament bridge contests, Winston Riley III, joined me in moulding the algorithms into a computer program. At that time my program was the only one I knew which could play suit or no-trump contracts at any level in any randomly generated hand. The program was the first one to address the full range of problems confronting the declarer of a bridge deal. For instance, the program considers winners to be developed, losers to be disposed of, finessing patterns, transportation between declarer's hand and dummy, hold-up plays, unblocking plays, and certain advanced plays for end situations.

The program performs both strategic and tactical analyses during the play of a deal. Strategic analysis is performed at the beginning of play and also after each trick. Tactical analysis is performed at the same time and, also, before playing a specific card from declarer's or dummy's hand. The Throop-Riley program operates in a time-sharing environment and plays both the declarer's and dummy's cards. Human opponents play the cards of the defenders and their play is entered into the computer. Exact defensive holdings are not known to the program except as established during play. The program is written in Fortran IV.

The computer program is given a deal in one of two ways. First, the cards may be dealt by the hand-dealing routine utilizing a random-number generating procedure. A hand dealt by this routine may be a newly encountered hand (i.e., never having been dealt before) or it may be a hand previously dealt and initiated by the same initial random number. Second, a specific deal may be input from the terminal. Thus, the computer is able to address any specific hand anyone would like to introduce into the program.

After the cards have been dealt (by the dealing routine or input from the terminal), the holdings are printed out in normal bridge style. Then the successful declarer, the trump suit or lack of it, and the trick objective must be input at the terminal. (As mentioned before, there is no bidding routine in the program.) The trick objective is the number of tricks the program will attempt to "make" playing as declarer with dummy. This trick objective may be the number of tricks associated with the contract or may reflect the number of tricks considered to be a good achievement in a bridge tournament.

The program prints out each card played by the declarer and dummy, in proper sequence, and requests a play from each defender at appropriate times. The program checks on legality of defenders' plays, keeps track of tricks played, and displays the number of tricks won by each side. On request, the program prints out the card holdings (indicating cards already played) in the normal bridge tableau. Because the program is implemented in time-sharing mode, play of the deal is accomplished within the time frame of normal bridge play.

Behavior of the program is heuristic in nature. The program evaluates trick objectives, formulates goals and executes play of the declarer's and dummy's cards. The program performs in accordance with heuristic principles I have always practiced in tournament play and which I incorporated into the computer program. Evaluation of the contract, goal formulation and execution of play simulate the situations faced by the declarer of the usual bridge deal. He lacks specific information about the location of a particular defensive card until it is played or until its location is established during the play of the game. Heuristic principles imbedded in program logic are those which have proved successful in tour-

nament play or which are known to be effective for a computer program.

Strategic analysis of the situation is made after the trick objective is stated and before any play has occurred. The analysis is done again after each trick. Such examination determines which suit to play. It also decides which hand to lead from if declarer is presently on lead or as soon as he can gain the lead. Strategic analyses determine available top tricks, and potential tricks to be gained in each suit by finessing, establishing length winners, or by ruffing.

Tactical analysis of a situation is completed before playing a specific card from the declarer's or dummy's hand. Also, as with strategy, a portion of the tactical analysis is made before plays have occurred and after each trick. Tactical analysis determines which card, when played, will be consistent with the strategic analysis. For instance, for the hand on lead a tactical analysis will produce such actions as: a high card; leading a low card for the purpose of finessing; developing winners; entering the opposite hand; pulling trumps; ruffing; or end-playing a defender. For a hand that plays second, third, or fourth, tactical analysis will consider the same problems and will also indicate the cards that were played by the defenders.

To illustrate the significant features of the strategic and tactical analysis, consider the deal below, dealt by the program's dealing routine:

Computer - NORTH (Dummy)

NORTH
♠ 8752
♥ AKQ4
♦ A8
♣ A76

WEST
♠ K43
♥ J1053
♦ 9542
♣ K8

EAST
♠ Q106
♥ 97
♦ J76
♣ Q10932

SOUTH
♠ AJ9
♥ 862
♦ KQ103
♣ J54

Computer - SOUTH (Declarer)

If Computer South is stated to be the declarer playing a no-trump contract with a trick objective of 10 tricks, the initial strategic analysis discovers that eight top winners exist. (One in spades, three in hearts, three in diamonds and one in clubs.) This leaves three tricks to be developed by the computer. The club suit doesn't offer any likely gain and is clearly the weakest suit. The diamond suit offers the possibility of developing an extra trick by finessing for the Jack. The heart suit offers the possibility of establishing an extra winner if the outstanding cards are divided 3-3. However, the spade suit offers the best opportunity: developing two extra tricks. A finessing combination exists for gaining one of those two tricks and an extra winner can be developed if the outstanding cards are divided 3-3.

Suppose West opens the King of clubs which attacks declarer's weakest holding. Below is the actual play of the hand by the computer if the defense continues to pursue the club suit. Bold-face indicates trick winner.

		West	Computer North	East	Computer South
Trick	1	KC	**AC**	9C	4C
	2	**KS**	8S	6S	9S
	3	8C	6C	**QC**	5C
	4	3S	7C	TC	**JC**
	5	3H	**AH**	7H	2H
	6	4S	2S	TS	**JS**
	7	2D	5S	QS	**AS**
	8	5H	**KH**	9H	6H
	9	TH	**QH**	2C	8H
	10	4D	**7S**	3C	3D
	11	5D	**AD**	6D	TD
	12	9D	8D	7D	**KD**
	13	JH	4H	JD	**QD**

Tricks N-S (computer): 11 Tricks E-W: 2

Annotations on the play:

Trick 1: Dealer wins the opening lead with dummy's Ace.

Trick 2: Strategic analysis has indicated that the spade suit offers the best way to develop two tricks. The proper way to play a finesse combination on the first round is to lead a low spade to the 9. Or, an equivalent card can be led from dummy and allowed to ride if a small card is present with the AJ9. The program chooses the latter, not aware that such a small card does not exist. The first round finesse against the 10 succeeds, losing to the King.

Trick 3: West pursues clubs.

Trick 4: East pursues clubs.

Trick 5: The dummy must be entered for a second-round spade finesse. The suit in which dummy has the most free entries is played to gain entrance.

Trick 6: The second-round spade finesse is taken. It succeeds because the King and Queen were divided.

Trick 7: The Ace of spades is cashed, dropping the Queen and establishing the thirteenth spade as a winner.

Tricks 8-13: The computer's trick objective is now assured with the thirteenth spade and the five top winners in hearts and diamonds. The computer must play these cards with caution so as not to block the diamond suit.

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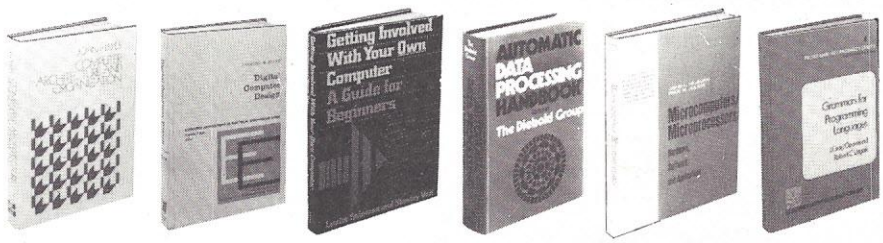

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Below is the play of the hand as printed out at the terminal. The documentation is actually printed in one column, but to consolidate space, the tricks are shown here in three columns.

TRICK 1
WEST TO PLAY
?KC
NORTH PLAYS
AC
EAST TO PLAY
?9C
SOUTH PLAYS
4C

TRICK 2
NORTH PLAYS
8S
EAST TO PLAY
?6S
SOUTH PLAYS
9S
WEST TO PLAY
?KS

TRICK 3
WEST TO PLAY
?8C
NORTH PLAYS
6C
EAST TO PLAY
?QC
SOUTH PLAYS
5C

TRICK 4
EAST TO PLAY
?TC
SOUTH PLAYS
JC
WEST TO PLAY
?3S
NORTH PLAYS
7C

TRICK 5
SOUTH PLAYS
2H
WEST TO PLAY
?3H
NORTH PLAYS
AH
EAST TO PLAY
?7H

TRICK 6
NORTH PLAYS
2S
EAST TO PLAY
?TS
SOUTH PLAYS
JS
WEST TO PLAY
?4S

TRICK 7
SOUTH PLAYS
AS
WEST TO PLAY
?2D
NORTH PLAYS
5S
EAST TO PLAY
?QS

TRICK 8
SOUTH PLAYS
6H
WEST TO PLAY
?5H
NORTH PLAYS
KH
EAST TO PLAY
?9H

TRICK 9
NORTH PLAYS
QH
EAST TO PLAY
?2C
SOUTH PLAYS
8H
WEST TO PLAY
?TH

TRICK 10
NORTH PLAYS
7S
EAST TO PLAY
?3C
SOUTH PLAYS
3D
WEST TO PLAY
?4D

TRICK 11
NORTH PLAYS
AD
EAST TO PLAY
?6D
SOUTH PLAYS
TD
WEST TO PLAY
?5D

TRICK 12
NORTH PLAYS
8D
EAST TO PLAY
?7D
SOUTH PLAYS
KD
WEST TO PLAY
?9D

TRICK 13
SOUTH PLAYS
QD
WEST TO PLAY
?JH
NORTH PLAYS
4H
EAST TO PLAY
?JD
TRICKS NS
11
TRICKS EW
2

Let's hear from Personal Computing *readers who have, or are developing, computer-bridge playing or bidding programs. Anybody want to exchange ideas relating to the development of such programs? Perhaps we can arrange a contest between programs. – Tom Throop*

No More Plugging/Unplugging

This little device will save you time and frustration. So, if you don't know one end of a soldering iron from the other, have a hardware-oriented friend build it for you.

BY DAVE ROSE

Let me see if I can guess where you stand right now. You've had your new TRS-80 for several weeks now, and you've never had so much fun! BASIC is beginning to feel like a second language to you, and your programs don't require nearly as much debugging as before. You're probably considering Level II BASIC, or perhaps you've already placed your order . . .

How did I do? Well, no matter. Wherever your personal development finds you at the moment, I'll bet you already love that little Radio Shack machine as if it were a member of the family. However, even family members can be annoying sometimes, and that's what this little article is about. Surely you've noticed what a real inconvenience it is to constantly plug and unplug that "Remote" jack to your cassette recorder? At first it was a minor problem for me, but soon it grew into a major hassle. No doubt you and a good many other TRS-80 owners feel equally as intimidated by that dumb plug. It also seems logical that so much plugging could eventually weaken the jack's contacts and cause data transfer problems.

Careful study of the schematic diagram of the recorder showed me a method for doing away with that particular problem. The "Remote" plug does nothing more than break the motor circuit so that an external switch (in this case, computer-controlled) can be used. So why not break the circuit in front of the plug?

All it takes is about $2 worth of parts and a rudimentary knowledge of soldering. In fact, if you've never done any soldering before, this task will make an excellent "first project". All you need is a double pole, double-throw switch and a little box in which to mount the switch. (I used one of those small Bakelite boxes from Radio Shack).

Once you've obtained the parts, cut the "Remote" cable and wire in the switch exactly as shown in Fig. 1. Be sure that the cable shielding is once again connected to itself when the switch is closed.

That's all there is to it! No more standing on your head trying to find the little hole so you can reconnect your recorder. Instead, just flip the switch! Naturally, you'll want to label the "on-line" and "unplugged" sides of the switch so you'll know when the recorder is connected; but once that's done, you're through.

One nice thing about this little modification is that it *in no way* affects *any* of Radio Shack's warranties! Since the only thing changed by this circuit is the connecting cable, none of the TRS-80 units themselves are in any way modified. □

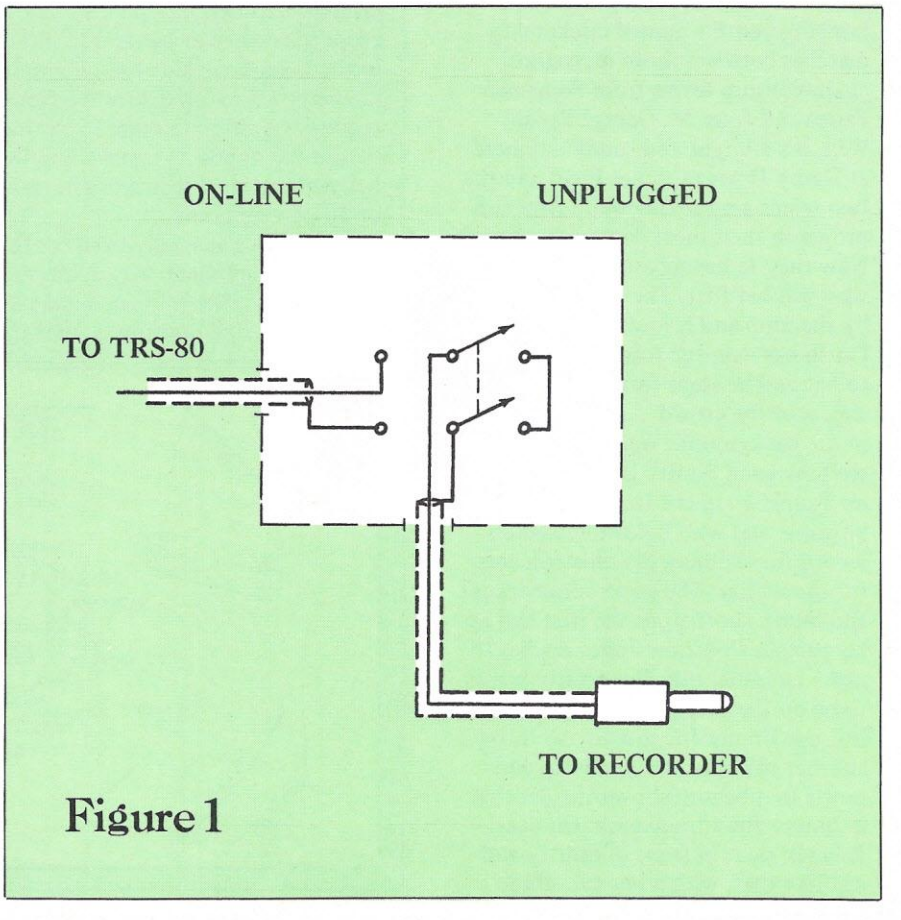
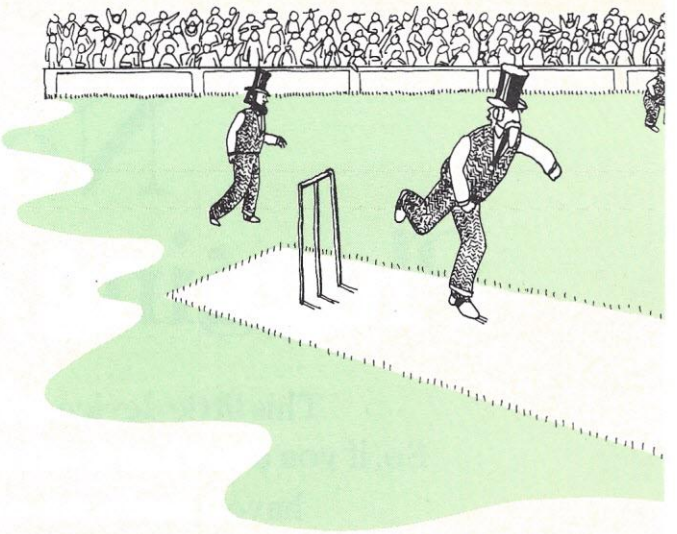


Figure 1



The Cricket That Lives In The Computer

BY HARRY SHERSHOW

If you happened to be in Bermuda one day this past season and happened to turn on your radio you might have heard the following announcement:

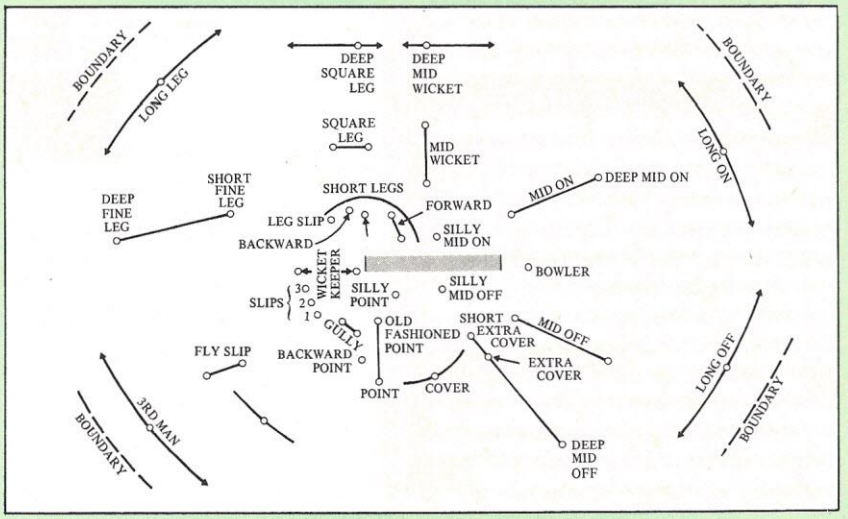
"Good afternoon, ladies and gentlemen. This is Brian H. esquire on your wireless, station 'TOOB' – the onion of Bermuda, ladies and gentlemen,– bringing you the annual cricket-cup matches between those marvelous championship teams from Somerset Parish and from St. George Parish. Well, it's a bright and sunny day here at Derby Downs Cricket Field and the two teams are looking quite trim and proper in their most dazzling uniforms. Now they're having a toss-up to see who will bat first. The coin is flipped by the ump and it looks like St. George Parish has won the toss. Smith is first to bat and he steps forward to the cheers of the crowd – as you can hear in the background. Well, we shall soon see how good Smitty is because he's up against good ole Jimmy Joe who is bowling, and who holds the Island's record for claiming the most wickets for the season. The game commences and Smith short-stops the first ball as his partner Courtney Jones readies to make an initial run. But Smitty wants to be on the safe side so they pass that ball up. Jimmy Joe is ready to throw another ball now. He winds up and bowls that beautiful over-hander that is Jimmy Joe's trademark. Oh dear! It break right in front of Smitty and just like that, with a one-two-three

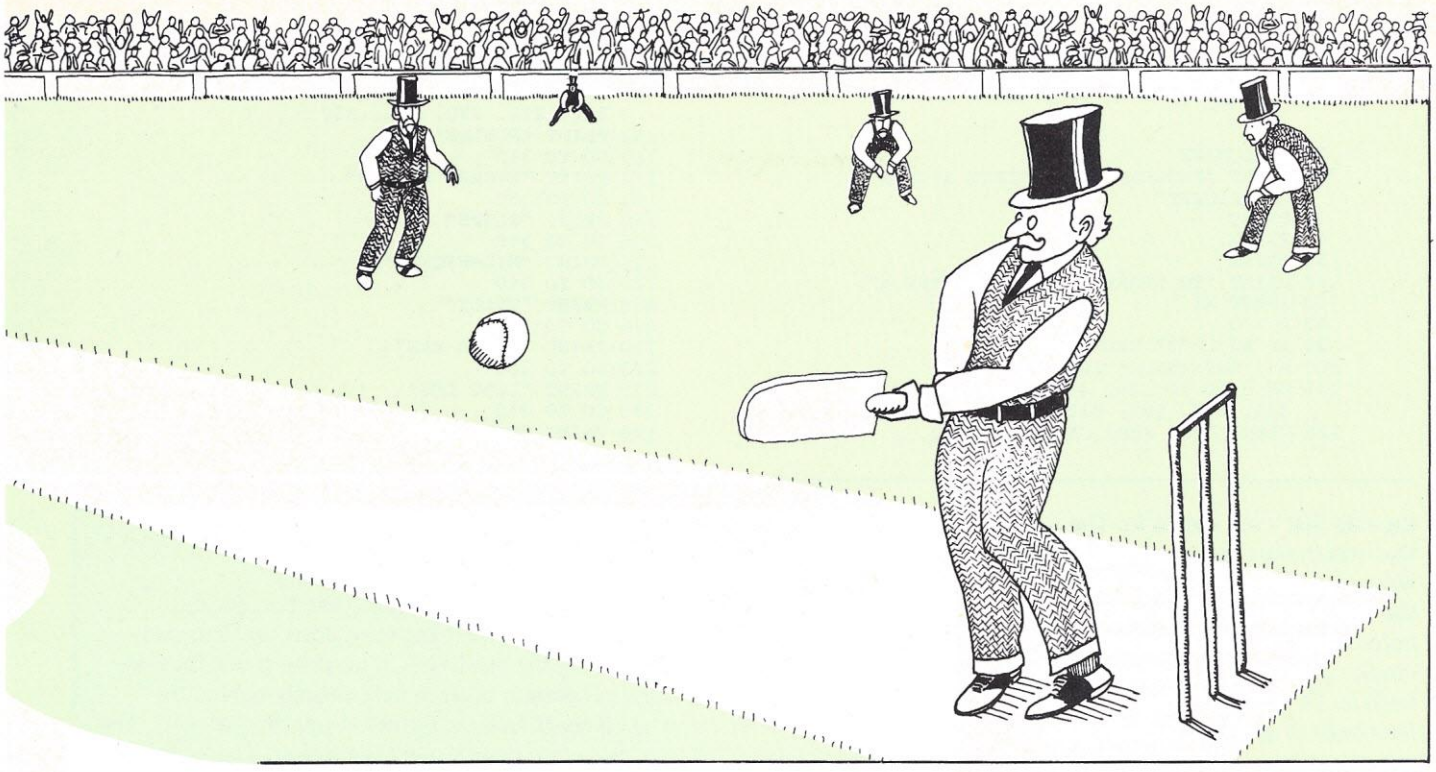
Official Rules of Cricket

A decent explanation of the game of cricket can be found in an encyclopedia. Part of such an explanation is reprinted here with permission of The Encyclopedia Americana, Copyright 1974, The American Corporation:

CRICKET is a game played with a bat and ball on a large field, known as a *ground,* between two teams of 11 players each. The object of the game is to score runs when at bat and to put out, or *dismiss,* the opposing batsmen when in the field. Each side has two innings, normally taken alternately. Matches are played for a predetermined length of time, and often two days or more are required to finish (a team at bat may accumulate as many as 300 to 400 runs before the opposing team can retire all players). International (Test) matches between national teams of selected players last at least five days or a minimum of 30 playing hours.

The names generally used for the positions of the fielding (attacking) team are bowler (pitcher), wicketkeeper (catcher), slips, gully, third man, cover, silly mid off, silly mid on, square leg, and long leg. The bowler and wicketkeeper play fixed positions; that is, they remain within specified areas while





oops! Smitty is out! He has been outbowled by Jimmy Joe! Smith is furious with himself! He throws down the bat, takes off his pads and storms angrily off to his own sidelines! He is hardly a happy man and neither are the two thousand fans of St. George's Parish who have come to this match to see their idols knock off the Somerset Bums, as they are wont to call them. Tucker is now up. He puts on his pads and strolls forward to have a go at that Jimmy Joe. Smiling Jimmy bowls his thirds and Tucker steps back.....Yes, ladies and gentlemen! Tucker has connected! He sends the ball smashing to the boundary! And it's a six! . . . . We'll be right back with more action from the cup matches right after this short message . . . . ."

Cricket, which is said to be the grandfather, or at least an ancient paternal relative of the American game of baseball, was developed around 1719. Before we bring cricket, you and the computer together in this program, it might help to explain the game. If you were stumbling out of an extended visit to a local London pub and had just asked one of the numerous cricket fans drooped over the bar with his pint of bitters to explain the game, this is what you think he had said to you:

"You have two sides. One out in the field and one in. Each man that's in the side that's in goes out and when he's out he comes in and the next man goes in until he's out. When the side that's out get the side that's in all out, performing at those positions. The captain stations the nine fielders in any one of the positions shown in diagram. Placement is governed by the skills of the bowler; the technique of the defending batsmen, who operate in pairs (which change often during an innings); and the condition of the ground.

Cricket ranks as the national summer sport of England, Australia, New Zealand, South Africa, and the West Indies, and is a prominent sport in India, Pakistan, and Ceylon. It is also played in Fiji and parts of the United States, Canada, and South America.

Ground and Equipment. The ground has no set dimensions. It may be circular or oval and must be limited to a maximum of 75 yards in any direction from its center. Boundaries may be marked by a line or a fence. The main action takes place in the middle of the ground on a *pitch,* a strip 66 feet long and 10 feet wide. Centered at either end of the pitch is a 9-inch-wide wicket composed of three thin 28-inch-long poles, or *stumps*, placed upright in the ground and of sufficient size to prevent the ball from passing between them. On top of the stumps are two 4 3/8-inch crosspieces, or *bails,* balanced in grooves in the stumps. A dislodged bail retires the batsman.

There are three limiting markings at each wicket. The *bowling crease* is in line with the stumps and is 8 feet 8 inches long. The *return crease* is formed by 4-foot arms at right angles to the bowling crease, two extending away from and two toward the opposite wicket. The *popping crease* is a 12-foot line parallel with and 4 feet in front of each bowling crease; this line designates the extent of the batsman's safe ground. In bowling, the bowler's front foot must remain completely within the return crease or its forward extension.

The ground is divided lengthwise into *offside* and *leg* or *on-side.* As the batsman takes his stand at the wicket the off-side is the ground to the right of a line drawn to the bowler's end opposite him. The leg or on-side is the ground to the left.

The bat has a willow striking face, which must not be more than 38 inches long, and a cane handle layered with thin strips of rubber bound with twine and covered with a sheath of rubber. The bat may not be wider than 4¼ inches and usually weighs between 4 and 6 ounces over 2 pounds.

The ball has a hand-stitched red leather cover and an interior of cork wound with twine. It weighs between 5½ and 5¾ ounces and measure 9 inches in circumference.

A cricketer's uniform is white: shirt, trousers, boots, and sweater. Batsmen and the wicket-keeper also wear gloves and pads to protect their hands and

Illustration by Richard Goldberg

Program Run

```
 10 RANDOMIZE
 20 PRINT "PROGRAM TO SIMULATE A GAME
    OF CRICKET"
 30 PRINT
 40 PRINT
 50 PRINT
 60 PRINT "TO START SIMULATION TYPE X";
 70 INPUT X$
 80 R = O
 90 IF X$ <>"X" THEN 999
100 A = INT (RND * 10 + 1)
110 ON A GO TO 120, 400, 420, 460, 490,
    520, 550, 580, 610, 630
120 PRINT "YOU WERE CAUGHT BY THE. . . .;
130 B = INT (RND * 10 + 1)
140 ON B GO TO 150, 170, 190, 210, 230,
    250, 270, 290, 310, 330
150 PRINT "BOWLER"
160 GO TO 350
170 PRINT "WICKET KEEPER"
180 GO TO 350
190 PRINT "SLIPS"
200 GO TO 350
210 PRINT "MID-WICKET"
220 GO TO 350
230 PRINT "GULLY"
240 GO TO 350
250 PRINT "THIRD MAN"
260 GO TO 350
270 PRINT "LONG LEG"
280 GO TO 350
290 PRINT "FINE LEG"
```

the side that's out comes in. The side that was in now has to get the side that was out, and is now in, out. Some of the men are often still in and not out before they are out. Sometimes the umpire goes out but he always comes back in. Or is it out? When both sides have been in and out, including the not-in-and-outs, then that's the end of the game."

Program to simulate a game of Cricket
BY DAVID A.L.A. WHITEHEAD,
OF HAVANT SIX FORM COLLEGE,
HAMPSHIRE, ENGLAND.

This program was designed to show one of the applications and uses of a random number generator and a simple use of character strings. The program is very simple and ideally suited to the beginer but it can be of interest for the more advanced student of BASIC as further expansion and extension of the program can be very absorbing.

Explanation of program

The statement of line 10 is to tell the computer/micro processer to set up a random number generator. The random number generator is a built-in function on the system I use so this would not apply to systems which do not have a built-in generator or a different generator. Any systems which do not have built-in generators can be supplemented with small programs at the start of this one. Lines 30-50 are to space the title from the start instruction. The print statement on its own just advances the type head down one line. Line 90 checks to see if a simulation is desirable; if not, the program is halted at line 999 with the END statement. It may be necessary to give the RND function an argument. Thus, line 100 would read A=INT(RND (X) 1031) instead of the way it is written in the program.

legs. The umpires wear long white coats over normal clothing.

Conduct of the Game. The captain of the side winning the toss decides whether his team should bat or field. The batting team posts one batsman at each wicket; the batsman taking the bowling first must keep one foot behind the popping crease, and his partner must remain entirely behind this crease. The bowler and wicketkeeper face each other at opposite wickets. The fielders are positioned roughly in two rings around the striker. Theoretically, an inner ring is placed to save one run, that is, to intercept or trap ground hits. The outer ring is positioned to save runs that might occur from long hits to the boundary. Two umpires – one at each end of the pitch – rule on the game.

A ball is bowled from each wicket alternately in a series of six, sometimes eight, balls, called *overs.* When an over is completed, the wicketkeeper moves to the other wicket, and a different bowler (a starting fielder) begins the next over from the opposite end. A bowler's objective (and the fielders' as well) is to *break the wicket* (displace the bails), which retires the batsman. If the bowler fouls in his stride or his bowl (he cannot jerk or throw the ball; he must bowl overarm), the umpire rules *no-ball;* if he bowls so high or so wide that the ball passes out of the batsman's reach, the umpire calls *wide ball.* No-balls and wides count as runs for the opposition but not as legal deliveries.

The striker tries to hit the ball sufficiently hard in any direction to enable him to exchange wickets with his partner before any fielder can get the ball to the stumps. Each time a batsman exchanges wickets he scores one run; on a long hit he may make as many as four runs. He need not, however, run on a short hit if he deems it risky.

In addition to no-balls, wides, and hits, runs may be scored from a *bye* (a ball that passes the wicket without touching the batsman's bat or person and which the wicketkeeper fails to stop); and from a *leg bye* (a ball that touches any part of the batsman except his hands). Only runs scored from the bat are credited to the batsman. Runs from no-balls, wides, byes, and leg byes are added to the side's score. A ball reaching the boundary is an automatic four runs; a fly ball hit over the boundary is six runs.

A striker can be declared out *bowled* (the ball breaks the wicket); *caught* (a fielder catches a ball before it touches the ground); *stumped* (a batsman moves out of the crease and the wicketkeeper dislodges a bail unintentionally); or *leg before wicket* (the striker's body, not his hands, intercepts a ball deemed likely by the umpire to strike the wicket). He also is out *hit the ball twice,* if he strikes the ball twice or if it hits his person and he strikes it again. Either batsman can be *run out* if a fielder breaks his wicket while he is outside his crease. Either can be declared out *obstructing the field* (interfering with a fielder) or out *handled the ball* (touched by hand during play.) No batsman can be retired for failing to hit a bowled ball.

An innings is completed when ten batsmen have been dismissed. (The partner of the man who is tenth out, having no one to bat with, is credited with

```
300 GO TO 350
310 PRINT "SQUARE LEG"
320 GO TO 350
330 PRINT "SECOND MAN"
340 PRINT
350 PRINT "YOUR TOTAL SCORE WAS", R
360 PRINT
370 PRINT
380 PRINT "FOR NEXT PLAYER TYPE X";
390 GO TO 70
400 PRINT "YOU WERE INJURED RETIRE TO THE
    PAVILION"
410 GO TO 340
420 PRINT "YOU WERE BOWLED"
450 GO TO 340
460 PRINT "YOU SCORED SIX RUNS"
470 R = R + G
480 GO TO 100
490 PRINT "YOU SCORED FOUR RUNS"
500 R = R + 4
510 GO TO 100
520 PRINT "YOU SCORED THREE RUNS"
530 R = R + 3
540 GO TO 100
550 PRINT "YOU SCORED TWO RUNS"
560 R = R + 2
570 GO TO 100
580 PRINT "YOU SCORED ONE RUN"
590 R = R + 1
600 GO TO 100
610 PRINT "YOU DID NOT SCORE"
620 GO TO 100
630 PRINT "GAME ABANDONED DUE TO RAIN"
640 GO TO 999
650 STOP
999 END
```

The way a game is played is decided by line 110. This determines whether a player scores runs or is knocked out of the game. This, in turn, is done by giving each number, generated by the operation on line, a possible outcome, i.e., the score is dependant on which number is generated. This outcome is then printed; e.g, YOU SCORED FOUR RUNS.

The player's score is kept in store R and up dated each time the player scores. When a player is dismissed, his total score is printed (line 350) and the R store is reset to 0 for the next player.

Typical output

```
RUN
PROGRAM TO SIMULATE A GAME
OF CRICKET
TO START SIMULATION TYPE X?
X
YOU SCORED FOUR RUNS
YOU SCORED ONE RUN
YOU SCORED TWO RUNS
YOU WERE CAUGHT BY THE...LONG LEG
YOUR TOTAL SCORE WAS 7
FOR NEXT PLAYER TYPE X?
```

and so on until the game is stopped at line 90.

Possible extensions

Lines 150 to 340 are rather bulky so it would be a good idea to shorten them by using a file to contain the names of the fielders. The program could be adapted to baseball fairly easily. Instead of fielder-names, individual names could be used and a game could be played using names of real players.

The program can be adapted so that a complete game is played and the total score given; or the names of the scorers and the number of runs each scored is given.

This is really the basic program and it is up to the user's imagination to adapt and extend it. There is a vast number of possible adaptations most of which are in the capabilities of a student who has been using BASIC for a short while. I hope you have every success.

being "not out.") Matches are decided by the aggregate of runs made by each side in two innings or, if the side batting last passes the other team's total before all their batsmen have been retired, by the number of their wickets (batsmen still to be dismissed) remaining.

Techniques of Play. A bowler delivers the ball overarm. He generally starts with a run to add speed to the ball, and he usualy aims to hit the pitch before striking the wicket. He varies both the direction and the length of the bowl. A *straight ball* goes in a direct line with the wicket. If spin is imparted to the ball, it will come up from the pitch at an angle. An *off break ball* hits the pitch on the off side of the wicket and turns toward the batsman and leg side; a *leg break ball* hits on the leg side of the pitch and turns across the face of the bat to the off. Bowlers also can make the ball swing in flight. An *inswinger* swerves from off to leg, thus moving into the batsman; an *outswinger* swerves from leg to off, moving away from the batsman. A ball is said to be *good length* if it comes off the pitch at such a distance from the batsman as to make him uncertain whether to step forward to play his stroke or to move back. For fast bowlers the wicketkeeper stands 12 to 15 yards behind the stumps. He crouches close to them to receive bowls of slow bowlers.

The striker should take a comfortable stance, with the weight evenly balanced on both feet and the knees slightly relaxed for easy and quick movement. The bat should be held straight (vertical), with the full face toward the ball. The batsman may either stop the bowled ball or hit it. By shifting his feet and wrist, he can hit the ball in any direction. If he makes a hit he decides whether or not to run; if the ball goes behind the wicket, his partner decides.

The basis of all batting strokes is the *forward stroke* to a straight ball. The striker steps with the front foot down the pitch, and hits the ball in front of the forward foot. Other strokes include the *drive,* in which the batsman lifts his bat higher than for the forward stroke and meets the ball just behind the forward toe; the *leg glance,* in which he deflects a ball bowled in a line with or outside his body to the on side; the *hook stroke,* in which he hits a short rising ball to the on-side with a cross bat; the *square cut,* in which he hits a short ball outside the off stump by stepping across the wicket and hitting down; the *late cut,* in which he plays a short ball outside the off stump, stepping across with his right foot and sending the ball past the slips. Cutting is an effective way of getting runs off short, fast balls bowled outside the off stump.

The condition of the pitch, as well as the weather, affects the bounce and liveliness of the ball. A pitch is judged *fast* if the ball comes off the ground quickly, and *slow* if it comes off sluggishly. During a match a pitch cannot be changed unless it becomes unfit for play, and then only with both captains' consent. If the captain of the side winning the toss believes the pitch and weather favor batting, he will probably take first innings.

–by John Lovesey, "Sunday Times", London

– (Writing in Encyclopedia Americana.)

Me and My TRS-80

BY MAROLYN B. PINNEY

My first experience with computers was on a newspaper. Not long after I began working for a small-town paper, it was sold to a company interested in upgrading the business to use modern typesetting standards. The employees were offered an opportunity to go to school and learn about the latest printing techniques and then use them in a new building with all new, largely computer-operated, equipment. I learned what kinds of things computers could do and loved it.

Several years after that first experience, I started working for the government. In a research and development section, I learned more about computers. Since the office was surrounded by computer people, it didn't take long to get the latest word processing equipment installed.

Next I went to Los Angeles to a Personal Computing Show. There, I decided I wanted my own computer. Soon after the show Radio Shack announced plans to build a computer. When they did, I bought it.

Now I'm learning – especially how much I don't know and how much more I want to know. Perhaps some of the things I've found out and have been thinking about personal computers may help someone else.

First thing I did was work my way through the book that came with the computer. It taught me the barest essentials of BASIC. (I'd taken a course in COBOL programming, which only taught me the barest essentials of how programming works.) For anyone mathematically inclined and/or mathematically educated, the book is probably sufficient. I have a strong suspicion it'd be easier for me to understand how the single dimension array works if I understood algebra better. But the sort of things the book teaches are not the sort of things that interest me most. I'm interested in the learning possibilities and word processing uses of a computer more than in figuring out how much paint it takes to cover my wall. However, I see a need for that kind of information and I'll add it to my small business idea file.

My primary argument with the book was that the topic I liked most was the least explained: storing results of the programs on tape. It's great to write a program, put it on tape and use it whenever I want. But I have to work hard to successfully put information on the tape and get it back the way I want. Of course, the word processing equipment at work has spoiled me because it makes everything so simple.

The programs accompanying this article work on Radio Shack Level I BASIC. They're nothing fancy but fun to play with. I think I've learned as much from the games I've translated or written as I have from the book. A few store owners I've talked with think it's wrong to sell the personal computer as a game-playing device. But I've never known a computer programmer or analyst who didn't play games or draw pictures on whatever computer was available to him.

Recently there was an open house where I work. The big computers were running bio-rhythms and drawing Snoopys. I brought in my Radio Shack computer for people to play with and was absolutely amazed at the response. I only had five games available, but everyone enjoyed them. Kids from about six years old, teenagers and one grandmother all tried their hand at Blackjack, Guess-a-Number and Friend.

Two of the men at work have decided (partially as a result of the games) to buy their own computers. One parent in the group told me the next day he was seriously considering one for the family. His kids really took to it.

My unsolicited advice to anyone considering buying a personal computer is: Do it!

Marolyn Pinney, a 55 year old mother of five and grandmother of five, works for the Federal Civil Service in a research and development section.

Illustration by Penny Carter

Craps

```
1    CRAP GAME
2    P."WITH THE COMPUTER AS YOUR OPPONENT.
     THE RULES ARE SIMPLE :"
3    P."* A 7 OR 11 ON THE FIRST ROLL WINS."
4    P."* A 2, 3, OR 12 ON THE FIRST ROLL LOSES."
5    P.
6    P."ANY OTHER NUMBER ROLLED BECOMES YOUR 'POINT'.
     YOU CONTINUE"
7    P."TO ROLL...IF YOU GET YOUR POINT, YOU WIN.
     IF YOU ROLL A 7,"
8    P."YOU LOSE.  THE DICE CHANGE HANDS WHEN THIS HAPPENS."
10   P.:P.
11   IN."WHAT NUMBER BETWEEN 1 AND 711 IS LUCKY FOR YOU TODAY";N
13   FOR I=1 TO N
14   LET X=RND(I)
15   NEXT I
16   LET Z=5*INT(10+11*RND(I))
17   P."SPLENDID...YOU ARE GIVEN ";Z;"DOLLARS TO PLAY WITH."
18   P.:P.
20   REM * IF N IS EVEN YOU ROLL FIRST, IF N IS ODD I ROLL FIRST. *
21   IF N-2*INT(N/2)=0 THEN 27
22   LET W=-1
23   P."I'LL ROLL FIRST..."
24   P.:P.
26   GOTO 31
27   LET W=1
28   P."YOU ROLL FIRST..."
29   P.:P.
31   LET Q=0
32   IN."HOW MUCH DO YOU BET ($$) ";B
34   P."OK..."
35   P.
36   IF B=INT(B) THEN 40
37   P.
38   P."NO COINS PERMITTED...JUST BILLS, PLEASE!"
39   GOTO 32
40   IF B=0 THEN 108
41   IF B<Z+1 THEN 44
42   P."DON'T TRY TO BET MORE THAN YOU HAVE, PLEASE!!"
43   GOTO 32
```

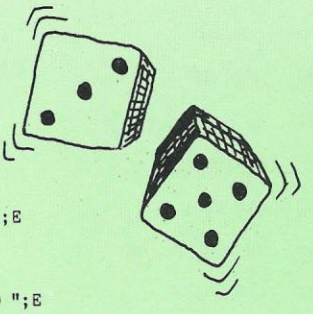
(The printout I got this from looked like this:

```
44   LET D1=INT(6*RND(1)+1)
45   LET D2=INT(6*RND(2)+1)
```

Craps is similar to a program in David Ahl's *101 BASIC Computer Games.* Someone at work gave me a printout of the game as it was put into a PDP-1170 computer. This was the copy I first put in my TRS-80. By trying this version and letting the computer tell me what lines it didn't understand, I found out where it had to be changed to run on the limited BASIC in Radio Shack Level I. The book version uses a " " to separate statements and Level I uses ":". Another difference is in the use of abbreviations allowed in Level I but not in all versions of BASIC.

Note that lines 11 through 17 set up a random generator giving you a number of dollars to bet with and establishes whether the computer or player rolls first. The crap game in the Radio Shack Level I book doesn't show a bet and plays out so quickly you can't see what the rolls are. I inserted a timer to lines 59 and 93 to slow it down. In the book form of lines 44 and 45, an array not available in Level I was used so I substituted a simpler form, using D and E for D1 and D2.

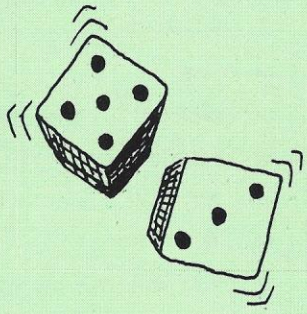
```
44   D=RND(6)
45   E=RND(6)
46   LET Q=Q+1
47   LET S=D+E
48   IF W>0 THEN 51
49   P."I ROLL";D;" AND ";E
50   GOTO 52
51   P."YOU ROLL";D;" AND ";E
52   IF Q<>1 THEN 84
53   IF (S-2)*(S-3)*(S-12)=0 THEN 62
54   IF (S-7)*(S-11)=0 THEN 69
55   IF W>0 THEN 58
56   P."SO MY POINT IS ";S
57   GOTO 59
58   P."SO YOUR POINT IS ";S
59   P."...LET'S ROLL 'EM AGAIN...":F.T=1TO750:N.T:P.
60   LET P=S
61   GOTO 44
62   P."AND CRAP OUT..."
63   LET C=1
64   IF W>0 THEN 67
65   LET Z=Z+B
66   GOTO 75
67   LET Z=Z-B
```



A revised version of David Ahl's book 101 BASIC Computer Games *is available under the title* BASIC Computer Games: Microcomputer Edition *for $8.50, from Creative Computing Press, P.O. Box 789-M, Morristown, NJ 07960.*

Craps continued

```
68   GOTO 75
69   P."AND PASS..."
70   LET C=1
71   IF W>0 THEN 74
72   LET Z=Z-B
73   GOTO 75
74   LET Z=Z+B
75   P.
76   IF Z<1 THEN 104
77   P."YOU NOW HAVE ";Z;"DOLLARS LEFT..."
78   IF C>0 THEN 81
79   P."CHANGE DICE NOW..."
80   P.
81   LET W=W*C
82   LET Q=0
83   GOTO 32
84   IF S<>7 THEN 92
85   P."AND LOSE..."
86   LET C=-1
87   IF W>0 THEN 90
88   LET Z=Z+B
89   GOTO 75
90   LET Z=Z-B
91   GOTO 75
92   IF S=P THEN 95
93   P."...ROLL AGAIN...":F.T=1 TO 750:N.T:P.
94   GOTO 44
95   IF W>0 THEN 100
96   P."AND MAKE MY POINT..."
97   LET C=1
98   LET Z=Z-B
99   GOTO 75
100  P."AND MAKE YOUR POINT..."
101  LET C=1
102  LET Z=Z+B
103  GOTO 75
104  P.
105  P."YOU HAVE RUN OUT OF MONEY...SORRY ABOUT THAT..."
106  P."THANKS FOR THE GAME...BETTER LUCK NEXT TIME, PARDNER!"
107  GOTO 110
108  P."THANKS FOR THE GAME...AND CONGRATULATIONS"
109  P."FOR BEING ABLE TO QUIT WHILE YOU WERE AHEAD."
110  END
```



Sample Run

```
CRAP GAME
WITH THE COMPUTER AS YOUR OPPONENT.  THE RULES ARE SIMPLE:
* A 7 OR 11 ON THE FIRST ROLL WINS.
* A 2, 3, OR 12 ON THE FIRST ROLL LOSES.
ANY OTHER NUMBER ROLLED BECOMES YOUR 'POINT'.  YOU CONTINUE
TO ROLL...IF YOU GET YOUR POINT, YOU WIN.  IF YOU ROLL A 7,
YOU LOSE.  THE DICE CHANGE HANDS WHEN THIS HAPPENS.
WHAT NUMBER BETWEEN 1 AND 711 IS LUCKY FOR YOU TODAY?45
SPLENDID...YOU ARE GIVEN 2415 DOLLARS TO PLAY WITH.
I'LL ROLL FIRST...
HOW MUCH DO YOU BET($$) ?1200
OK
I ROLL 6 AND 1
AND PASS...
YOU NOW HAVE 1215 DOLLARS LEFT...
HOW MUCH DO YOU BET($$) ?510
OK
I ROLL 1 AND 6
AND PASS...
YOU NOW HAVE 605 DOLLARS LEFT...
HOW MUCH DO YOU BET($$) ?305
OK
I ROLL 3 AND 5
SO MY POINT IS 8
...LET'S ROLL 'EM AGAIN...
I ROLL 4 AND 6
...ROLL AGAIN...        YOU NOW HAVE 300 DOLLARS LEFT...
I ROLL 5 AND 5          HOW MUCH DO YOU BET($$) ?100
...ROLL AGAIN...        ---ABOUT 10 PASSES AND THEN---
I ROLL 1 AND 4          I ROLL 1 AND 6
...ROLL AGAIN...        AND LOSE...
I ROLL 5 AND 4          YOU NOW HAVE 400 DOLLARS LEFT...
...ROLL AGAIN...        CHANGE DICE NOW
I ROLL 2 AND 3          and so on...
...ROLL AGAIN...
I ROLL 6 AND 2
AND MAKE MY POINT
```

Guess-A-Number 1234?

This game is around in many versions. Before I finished the manual that came with my Radio Shack TRS-80, I wrote this to test my own programming abilities. It's not fancy, but it hooked a couple of people.

```
6   CLS
8   PRINT
10  X=ABS(N)
20  X = RND(100)
30  P."I HAVE A NUMBER.  IT IS BETWEEN 1 AND 100 INCLUSIVE."
40  P."CLUES OF TOO LARGE AND TOO SMALL WILL BE GIVEN."
50  P."SEE HOW FAST YOU CAN GUESS MY NUMBER."
60  IN."PICK A NUMBER FROM 1 TO 100";Q
70  FOR G=0 TO 100
75  T=G+1
80  IF Q=X GOTO 400
90  IF Q<X GOTO 200
100 IF Q>X GOTO 300
110 NEXT G
200 IN."TOO SMALL, GUESS AGAIN. ";Q
210 NEXT G
300 IN."TOO LARGE, GUESS AGAIN. ";Q
310 NEXT G
400 P."YOU GOT IT!"
410 P."IT TOOK YOU ";T;"GUESSES."
420 IF T<=5 THEN P."VERY GOOD!"
430 IF T>=6 THEN 440
440 P."CAN YOU FIGURE A WAY TO GUESS MY NUMBER FASTER?"
450 IN."WANNA PLAY SOME MORE? ";H
455 Y=1:N=0
460 IF H=1 GOTO 6
470 IF H=0 THEN 750
750 END
```

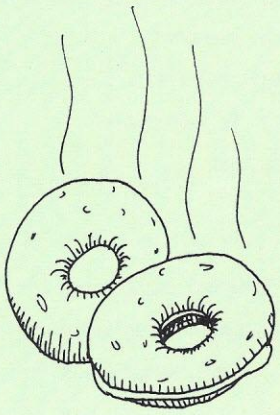
Sample Run

```
I HAVE A NUMBER.  IT IS BETWEEN 1 AND 100 INCLUSIVE.
CLUES OF TOO LARGE AND TOO SMALL WILL BE GIVEN.
SEE HOW FAST YOU CAN GUESS MY NUMBER.
PICK A NUMBER FROM 1 TO 100 ?50
TOO LARGE, GUESS AGAIN. ?25
TOO LARGE, GUESS AGAIN. ?12
TOO SMALL, GUESS AGAIN. ?17
TOO LARGE, GUESS AGAIN. ?13
TOO SMALL, GUESS AGAIN. ?16
TOO LARGE, GUESS AGAIN. ?15
YOU GOT IT!
IT TOOK YOU  7  GUESSES.
CAN YOU FIGURE A WAY TO GUESS MY NUMBER FASTER?
WANNA PLAY SOME MORE? ?YES
I HAVE A NUMBER.  IT IS BETWEEN 1 AND 100 INCLUSIVE.
CLUES OF TOO LARGE AND TOO SMALL WILL BE GIVEN.
SEE HOW FAST YOU CAN GUESS MY NUMBER.
PICK A NUMBER FROM 1 TO 100 ?76
TOO SMALL, GUESS AGAIN. ?89
TOO LARGE, GUESS AGAIN. ?80
TOO SMALL, GUESS AGAIN. ?84
TOO LARGE, GUESS AGAIN. ?82
TOO LARGE, GUESS AGAIN. ?81
YOU GOT IT!
IT TOOK YOU  6  GUESSES.
CAN YOU FIGURE A WAY TO GUESS MY NUMBER FASTER?
WANNA PLAY SOME MORE? ?Y
I HAVE A NUMBER.  IT IS BETWEEN 1 AND 100 INCLUSIVE.
CLUES OF TOO LARGE AND TOO SMALL WILL BE GIVEN.
SEE HOW FAST YOU CAN GUESS MY NUMBER.
PICK A NUMBER FROM 1 TO 100 ?50
TOO SMALL, GUESS AGAIN. ?75
TOO SMALL, GUESS AGAIN. ?87
TOO SMALL, GUESS AGAIN. ?96
TOO LARGE, GUESS AGAIN. ?91
YOU GOT IT!
IT TOOK YOU  5  GUESSES.
CAN YOU FIGURE A WAY TO GUESS MY NUMBER FASTER?
WANNA PLAY SOME MORE? ?NO
```

Bagles

Here is a game from David Ahl's book of *101 Basic Computer Games.* I get hooked on the problems using three responses to tell if you have any numbers correct. I got so tangled up in absolute numbers that I didn't leave many line numbers open to add more digits. One of the drawbacks to the TRS-80 Level I BASIC for me, is the inability to renumber lines automatically. Another is having to type a whole line over if I want to change one letter, word or number. (Since I had Level II installed, I find it automatically numbers lines as I put them in, but won't renumber. But the editing is much better.)

```
1   CLS
5   A(1)=RND(9)
6   A(2)=RND(9)
7   A(3)=RND(9)
8   IF(A(1)=A(2))+(A(1)=A(3))+(A(2)=A(3))T.5
13  Y=1
14  N=0
15  IN."GAME OF BAGLES. WOULD YOU LIKE THE RULES?(YES/NO)";B
17  IF (B<>1)*(B<>0)GOS.500
18  IF B=0 THEN 30
25  P."I HAVE A 3-DIGIT NUMBER. TRY TO GUESS MY NUMBER-"
26  P."THE FOLLOWING CLUES WILL BE GIVEN."
27  P."PICO   - ONE DIGIT CORRECT BUT IN WRONG POSITION"
28  P."FERMI  - ONE DIGIT CORRECT AND IN RIGHT POSITION"
29  P."BAGLES - ONE DIGIT INCORRECT"
30  FOR C=1 TO 20
35  P."GUESS # ";C;
36  IN. H
40  I=H/100
50  J=INT(I)
60  K=J-I
70  L=ABS(K)*10
80  M=INT(L)
90  R=M-L
100 O=(ABS(R))*10+.05
110 P=INT(O)
115 Q=ABS(P)
120 IF (J=A(1))*(M=A(2))*(Q=A(3)) THEN 400
125 IF J=A(1) P."FERMI ";
126 IF M=A(2) P."FERMI ";
127 IF Q=A(3) P."FERMI ";
130 IF J=A(2) P."PICO ";
132 IF J=A(3) P."PICO ";
140 IF M=A(1) P."PICO ";
142 IF M=A(3) P."PICO ";
150 IF Q=A(1) P."PICO ";
152 IF Q=A(2) P."PICO ";
160 IF (J<>A(1))*(J<>A(2))*(J<>A(3))P."BAGLES ";
165 IF (M<>A(1))*(M<>A(2))*(M<>A(3))P."BAGLES ";
170 IF (Q<>A(1))*(Q<>A(2))*(Q<>A(3))P."BAGLES ";
335 P.:NEXT C
400 P."YOU GOT IT!!"
405 GOS.900
410 IN."WANNA PLAY AGAIN ";B
415 IF (B<>0)*(B<>1)G.520
420 IF B=0 G.999
430 IF B=1T.1
500 P."I CANNOT COMPUTE *&%#$* PLEASE ANSWER YES OR NO."
510 G.15
520 P."I DON'T DIG. PLEASE ANSWER YES OR NO."
530 G.410
900 IF C=1 THEN 950
910 IF C<6 THEN 960
920 IF (C>5)*(C<11) THEN 970
930 IF C>10 THEN 980
950 P."YOU MUST BE CLAIRVOYANT!":RET.
960 P."PRETTY SHARP!":RET.
970 P."YOU PLAYED A PRETTY GOOD GAME.":RET.
980 P."PRACTICE! PRACTICE!":RET.
999 P."HOPE YOU HAD FUN. I DID. BYE":END
```



Sample Run

```
GAME OF BAGLES. WOULD YOU LIKE THE RULES? (YES/NO)?YES
I HAVE A 3-DIGIT NUMBER. TRY TO GUESS MY NUMBER-
THE FOLLOWING CLUES WILL BE GIVEN.
PICO   - ONE DIGIT CORRECT BUT IN WRONG POSITION
FERMI  - ONE DIGIT CORRECT AND IN RIGHT POSITION
BAGLES - ONE DIGIT INCORRECT
GUESS # 1? 345
PICO PICO BAGLES
GUESS # 2? 123
FERMI FERMI BAGLES
GUESS # 3? 423
FERMI BAGLES BAGLES
GUESS # 4? 153
YOU GOT IT!!
PRETTY SHARP!
```

Friend Game

This program is more of a questionnaire than a game. I learned a lot about loops putting it together. A surprising thing about this game became evident at the open house. A couple of people told me they got a variety of answers – including some that aren't programmed in. Apparently computers do not stifle imagination. The players read into the answers more than I wrote. The program can be changed around by changing the question (INPUT) and response (PRINT) lines.

```
5   CLS
10  Y=1
20  N=0
30  INPUT"HI - MY NAME IS MIKE.  WHAT'S YOURS";A$
35  PRINT A$;
36  IN. ", WOULD YOU LIKE TO BE MY FRIEND";B
40  IF B=1 THEN 200
50  IF B=0 THEN 400
60  IF B<>0 THEN GOSUB 600
200 INPUT "MAY I ASK A FEW QUESTIONS";B
204 IF B=1 THEN 210
206 IF B=0 THEN 300
208 IF B<>0 THEN GOSUB 600
210 INPUT "ARE YOU AN OPTIMIST";B
212 IF B=1 THEN 430
216 IF B=0 THEN 310
218 IF B<>0 THEN GOSUB 600
221 INPUT "DO YOU LIKE TO TRAVEL";B
222 IF B=1 THEN 440
225 IF B=0 THEN 320
226 IF B<>0 THEN GOSUB 600
231 INPUT "DO YOU ENJOY CAMPING";B
232 IF B=1 THEN 450
236 IF B=0 THEN 330
238 IF B<>0 THEN GOSUB 600
241 INPUT "WOULD YOU LIKE TO TAKE A CANOE TRIP WITH ME";B
244 IF B=1 THEN 250
246 IF B=0 THEN 340
248 IF B<>0 THEN GOSUB 600
250 PRINT "KISS ME!"
255 END
300 INPUT "DO YOU HAVE SOMETHING TO HIDE";B
302 IF B=1 THEN 400
304 IF B=0 THEN 210
306 IF B<>0 THEN GOSUB 600
310 PRINT "CHEER UP!"
315 GOTO 221
320 PRINT "WELL, SOMEBODY HAS TO STAY HOME."
325 GOTO 231
330 PRINT "MAYBE YOU HAVEN'T TRIED IT WITH THE RIGHT PERSON."
335 GOTO 241
340 PRINT "HOW ABOUT TAKING ME TO DINNER?"
345 END
400 PRINT "BUZZ OFF, TURKEY!"
410 END
430 PRINT "GOOD!  I LIKE THAT."
435 GOTO 221
440 PRINT "ME TOO."
445 GOTO 231
450 PRINT "SO DO I."
455 GOTO 241
600 PRINT "YOU KNOW HOW COMPUTERS ARE."
601 INPUT "WAS THAT A POSITIVE (P) OR NEGATIVE (N
605 IF Q=P THEN 620
610 IF Q=N THEN 630
615 IF Q<>N THEN 640
620 PRINT "THANK YOU."
625 RETURN
630 PRINT "I'M SORRY TO HEAR THAT."
635 RETURN
640 INPUT "WHAT";Q
645 GOTO 605
```

Sample Run

```
HI - MY NAME IS MIKE.  WHAT'S YOURS?GEORGE
GEORGE, WOULD YOU LIKE TO BE MY FRIEND?Y
MAY I ASK A FEW QUESTIONS? WHY NOT
YOU KNOW HOW COMPUTERS ARE.
WAS THAT A POSITIVE (P) OR NEGATIVE (N)?P
THANK YOU
ARE YOU AN OPTIMIST?Y
GOOD! I LIKE THAT.
DO YOU LIKE TO TRAVEL?Y
ME TOO.
DO YOU ENJOY CAMPING?Y
SO DO I.
WOULD YOU LIKE TO TAKE A CANOE TRIP WITH ME?Y
KISS ME!
```

LOOPING

The more you think you know about a principle, the surer it is that you do not understand it.
—Veeblefetzer's Principle

BY TOM LOGSDON

In this article we'll examine the looping capabilities built into the BASIC language. A loop is essentially a branch point which feeds back onto itself. Each time the computer passes through the loop it compares the values of two quantities stored within its memory. Depending on the outcome of this comparison the computations within the loop are either repeated or terminated. You should be especially careful to master the looping capabilities in BASIC because it is primarily looping which gives the languages its enormous power and flexibility.

COMPOUND INFLATION: A SAMPLE PROGRAM

Our first program initiates a series of looped calculations to determine the effects of compound inflation on the cost of our common consumer products. The program automatically determines the cost of a $469 television set in each of the next 10 years assuming that we will have a constant 9-percent inflation rate compounded annually. By *compound inflation* we mean that each year our prices will be 9 percent higher than the prices in the previous year.

The flowchart in Figure 1 shows how the program is constructed. The inputs are the price, P, of the television set and the inflation rate, R. (Note that a 9 percent inflation rate is expressed in decimal form as 0.09.)

Once these inputs have been provided, we initialize the year (Y) by setting it equal to 1 (i.e., the computations start in year 1). Next, we enter a repetitive loop in which the new price at the end of each year is computed. The new price equals the old price times the quantity (1 + R) where R is the inflation rate. Specifically, the price of the TV set at the end of the first year is computed as follows:

P = P * (1 + R)
P = $469 * (1 + 0.09)
P = $511.21

Once the new price has been computed, it is automatically printed together with the current value of the variable Y. The computer then checks the value of Y to see if it equals 10. If Y *does not* equal 10, it is incremented by 1 and the computations are repeated. If Y *does* equal 10, the computations are automatically halted.

Note that the PRINT statement is included within the loop. Thus, when we run the program, it will print out 10 different values of Y and P, one pair for each of the ten years covered by the computations.

The program commands are relatively straightforward. The first three initialize the values of P (the price of the television set), R (the inflation rate) and Y (the year).

Statement 40 computes the new price of the TV set for each of the 10 years. This is accomplished one year at a time by setting the new price equal to the old price times (1 + R).

Statement 50 prints the computed values of Y and P – the current *year* and the *price* of the television set in that particular year.

The IF test in statement 60 determines if the computations have been carried out the desired number of times. If Y is *equal to* 10, control is transferred to statement 90 and the computations are halted.

On the other hand, if Y is *less* than 10, control drops through to statement 70 and Y is set equal to (Y + 1); that is, the year is incremented by 1. At this point, control drops through to statement 80 which unconditionally reroutes the computations back to statement 40 where the price for the next year is automatically evaluated.

The printout in Figure 1 provides us with the price of the television set for each of the ten years in question. As you can see, the price shoots up from $469 to a staggering total of $1110 in just 10 years. Thus, if current inflation rates prevail, the prices of our common consumer products will more than double every decade.

In this particular case we have computed the price of the television set for a 10 year interval. However, if we wanted to know its price for each of the years in the next century, we have only to change statement 60 as follows:

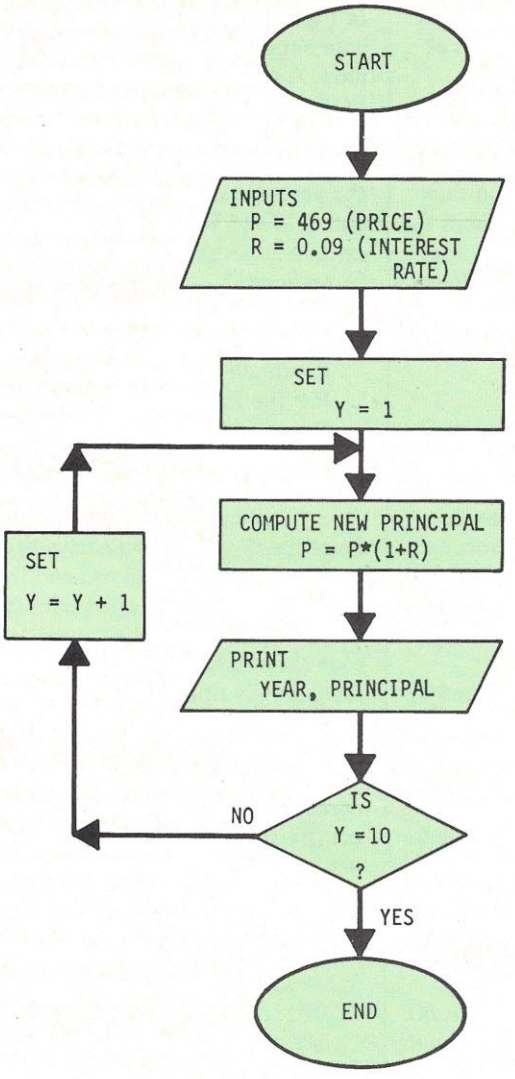
60 IF Y = 100 then 90

If we want the prices for the next 10 centuries, we have only to write:

60 IF Y = 1000 THEN 90

Are you beginning to perceive the enormous powers of the looping capabilities which are built into the BASIC language? With 9 simple BASIC commands we can make our computer determine the price of a color television

Figure 1 – The Price of a Color TV



THE PROGRAM COMMANDS

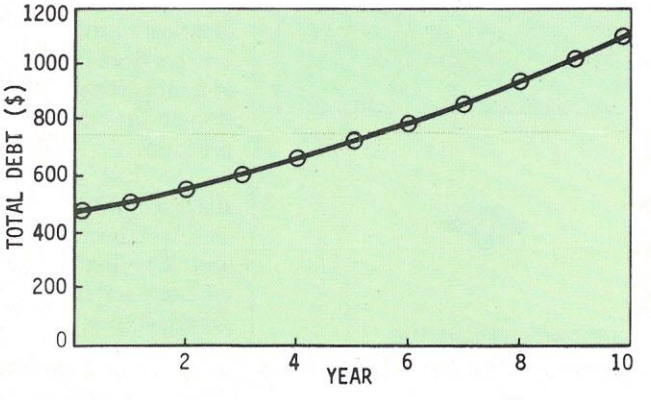
```
10  LET P = 469
20  LET R = 0.09
30  LET Y = 1
40  LET P = P*(1+R)
50  PRINT Y,P
60  IF Y=10 THEN 90
70  LET Y = Y+1
80  GO TO 40
90  END
```

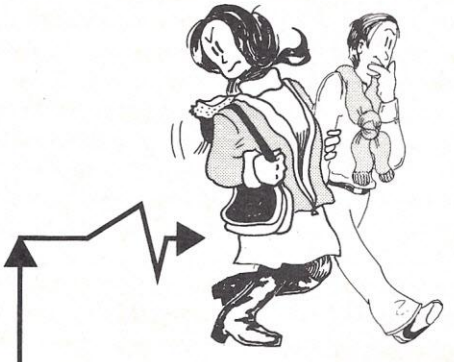
THE PRINTOUT

RUN

YEAR	PRINT
1	511.21
2	557.219
3	607.369
4	662.032
5	721.615
6	786.56
7	857.35
8	934.512
9	1018.62
10	1110.29

A GRAPH OF THE RESULTS





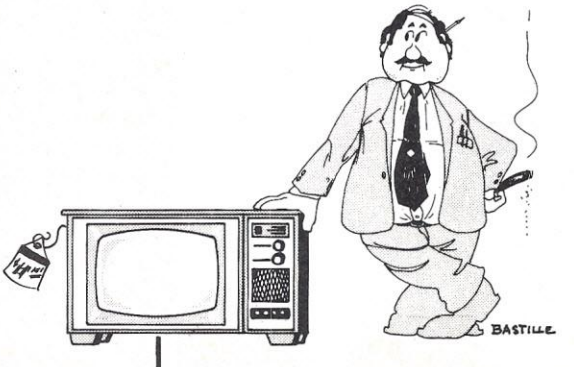


Figure 2 – FOR...NEXT Loop

THE OLD PROGRAM COMMANDS

```
10  LET P = 469
20  LET R = 0.09
30  LET Y = 1
40  LET P = P*(1+R)
50  PRINT Y,P
60  IF Y >=10 THEN 90
70  LET Y = Y+1
80  GO TO 40
90  END
```

NEW COMMANDS: FOR...NEXT LOOP

```
10  LET P = 469
20  LET R = 0.09
30  FOR Y = 1 TO 10 STEP 1
40  LET P = P*(1+R)
50  PRINT Y,P
60  NEXT Y
70  END
```

THE PRINTOUT

```
RUN
 YEAR          PRICE
  1            511.21
  2            557.219
  3            607.369
  4            662.032
  5            721.615
  6            786.56
  7            857.35
  8            934.512
  9            1018.62
  10           1110.29
```

set for the next 1000 years! Nor is this by any means the end of the game. As soon as you learn a little more about BASIC you will have even more impressive powers at your fingertips.

The small graph in the lower right hand corner of Figure 1 provides a convenient pictorial representation of the effects of spiraling inflation on our economy. Even if inflation remains at a constant level, the prices of the things we buy will move upward at an ever increasing rate. This effect is called *compounding.* It stems from the fact that the price we pay for an item each year is based on the price we paid in the previous year. Hence the price builds up at a surprisingly rapid rate. A mathematician would call this process *exponential growth.*

FOR. . .NEXT LOOPS

Repetitive loops are crucially important to the modern data processing industry. In fact, they are so important that two special commands called a FOR. . .NEXT loop have been incorporated into the BASIC language. The FOR. . .NEXT commands make it easier to set up a loop of repeated calculations.

The program in Figure 2 illustrates the proper use of a FOR. . .NEXT loop. This program does the same thing as the one in Figure 1, but it is coded in a simpler way. Most of the commands are identical to their counterparts in Figure 1 so we need not go through them one at a time. Instead, we focus our attention on the critical regions of the new program.

The FOR. . .NEXT loop starts at statement 30 and ends at statement 60. This loop is interpreted in the following way: The first time the computer encounters statement 30 the value of Y is set equal to 1. Control then passes to statements 40 and 50 where the indicated operations are performed. When the computer reaches statement 60, it automatically checks the value of Y. If Y equals 10, control passes to statement 70; if Y is less than 10 control passes back to statement 30, when Y is incremented by 1 as indicated by the entry STEP 1 in the FOR command. The entire procedure is then repeated. This happens over and over again. When the value of Y finally equals 10, control passes to the statement just below the NEXT statement (in this case statement 70).

As you can see by the printout in Figure 2, the FOR. . .NEXT loop produces results identical to the ones in Figure 1. However, the FOR. . .NEXT approach is far more convenient and easier to understand.

GENERALIZED FOR. . .NEXT LOOPS

In Figure 2 we encountered a simple bare-bones example of a FOR. . .NEXT loop. A more generalized version of the FOR. . .NEXT loop is presented in Figure 3. This program computes the cumulative increase in our war debts in the years that have elapsed since the end of World War II. A 6 percent interest rate is assumed with semi-annual compounding.

As the program flowchart shows, there are four inputs to the program:

P = the Principal Owed
R = the Interest Rate to be Paid
N = the Number of Years That Have Elapsed
Y = the Year the Money was Borrowed

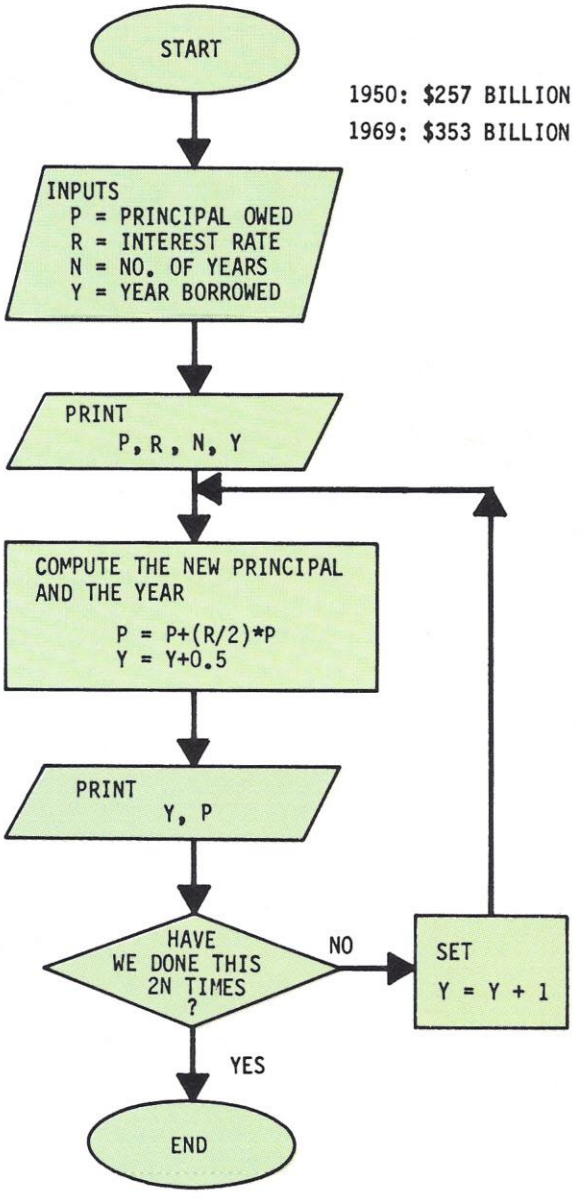
Once the program inputs have been provided, they are printed out and then the program initiates a looped calculation in which a new principal is computed for each six-month interval. This loop is repeated 2N times where N is the number of years that have elapsed since the war was over.

Statements 10 and 110 provide the computer with the values of the principal (P), the interest rate (R), the number of years for the computations to proceed (N) and the year the money was borrowed (Y). Note that the 1945 federal debt of $250,000,000,000 is expressed in scientific notation as 2.50E11.

Statements 20 to 50 print out the values of the inputs. Next statement 60 provides headers for the quantities to be computed in the loop – the year (Y) and the new principal (P).

The loop runs from statement 70 through statement 100. The FOR command in this program is considerably more complicated than the one that appeared in Figure 2. When statement 70 is first encountered, the *index of the loop,* X, takes on the value of Y (the year in which the money was borrowed). Each time the computer passes through the loop, the value of X is checked to see if it exceeds Y + N. If not, the value of X is increased by 0.5 years. This looped procedure is automatically terminated when the value of X exceeds Y + N.

Figure 3 – The Interest On Our Federal Debt



THE LISTING

```
10  READ P,R,N,Y
20  PRINT "PRINCIPAL" P
30  PRINT "INTEREST RATE" R
40  PRINT "NO. YEARS" N
50  PRINT "YEAR  BORROWED" Y
60  PRINT "YEAR", "NEW PRINCIPAL"
70  FOR X = Y TO Y+N STEP 0.5
80  LET P = P+(R/2)*P
90  PRINT X,P
100 NEXT X
110 DATA 2.50E11,0.06,30,1945
130 END
```

THE PRINTOUT

```
RUN
PRINCIPAL 2.50000E+11
INTEREST RATE 0.06
NO. YEARS 30
YEAR  BORROWED 1945
     YEAR          NEW PRINCIPAL
     1945           2.57500E+11
     1945.5         2.65225E+11
     1946           2.73182E+11
     1946.5         2.81377E+11

     1974.5         1.47290E+12
     1975           1.51709E+12
```

Note that the equation in statement 80 which computes the current principal:

P = P + (R/2) * P

is not the same as the equation which we used in the previous program. The reason we divide the value of the interest rate R by 2 in this case is that the interest on a loan is always quoted on an *annual* basis whereas we are computing the compound interest on a *semi-annual* basis. Dividing by 2 adjusts the interest rate in the appropriate manner.

The printout in the lower right hand corner of Figure 3 shows what would have happened if we had made no principal or interest payments on our federal debts since the end of World War II. As you can see, our total indebtedness would have amounted to $1517 billion by 1975. At that time our total federal debt actually amounted to $400 billion. Thus, we see that, on the average, we were able to make fairly substantial interest payments in the intervening years; however, we were unable to pay off any of the principal. □

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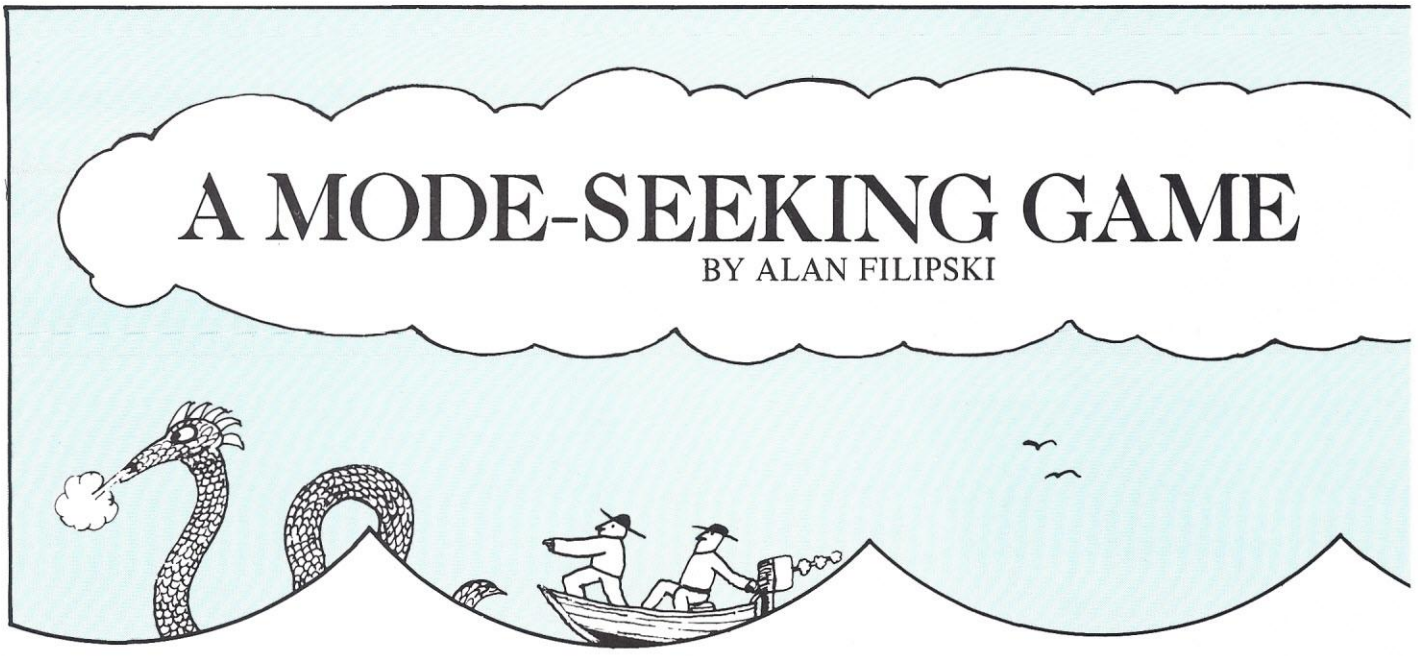
A MODE-SEEKING GAME

BY ALAN FILIPSKI



Consider the following situations:

1. You're with Marlin Perkins on the planet Deneb IV trying to locate a Denebian slime devil so you can tag it for scientific purposes. Since the slime devil exhales hydrogen sulfide, you'd like to find the region of highest H_2S concentration. You have a limited number of pieces of sulfide test paper with which you can test the concentration at any point. Locate the slime devil.

2. You're on board the *Calypso* with Jacques Cousteau searching for the deepest part of an ocean trench. You have an apparatus to tell you the depth of the water immediately below you. Locate the deepest point with the fewest number of depth soundings.

3. You've designed a time-sharing virtual-memory operating system for the Cray-1 computer which has several arbitrary numerical parameters controlling priorities, time-slicing, paging and so forth. You observe that by varying these numbers, you vary the system throughout. Run tests to find the combination of parameter values which maximize the throughput.

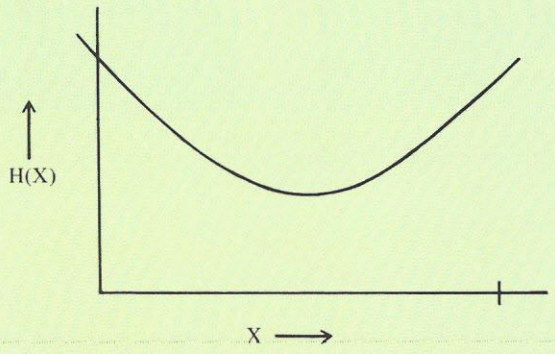
Each of these (admittedly artificial) situations involves finding the maximum or minimum value of a function of several variables. Mathematically, a function is a "black" box" with several numerical inputs and a single numerical output. The problem is to find the combination of input values which maximizes or minimizes the output. This optimum combination of inputs is called the mode of the function.

When there are exactly two inputs, the problem has a nice spatial interpretation. The two inputs are x-y coordinates defining a point in the plane, and the output can be considered the z-coordinate or elevation of a surface over that point. Finding the peak of a mountain (or bottom of a valley) by taking elevation measurements at a limited number of latitude-longitude points is exactly what you are doing, for example, in the "Jacques Cousteau" problem.

If the surface you're exploring is extremely irregular, taking several sample points gives you almost no information about the location of the modal point. If, on the other hand, the surface is smooth, with a gradual slope, a couple of sample points could tell you if you're headed in the right direction.

For this reason, state explicitly the conditions you assume will hold for your surfaces. First, assume the surface has no sheer vertical drops. Also, assume the surface has a single mode of the type you are looking for, and no flat areas or lesser peaks or valleys in which the search could get trapped. With these conditions you can develop some powerful search methods.

FIGURE 1



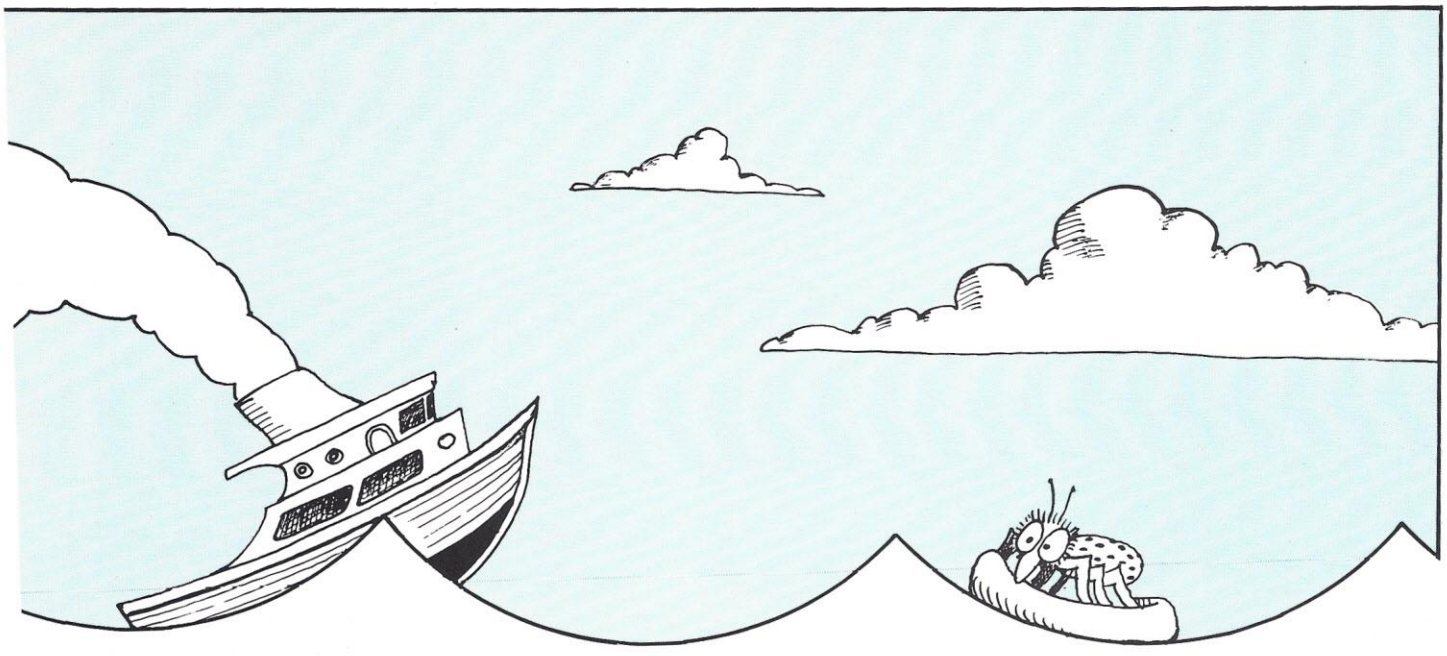
A Smooth curve with a single minimum

The problem boils down to this: how to best utilize the information from each observation to home in as quickly as possible on the answer. It's a simple problem to state, but formatting a good strategy is challenging. For this reason I have set up a simple one-person game to test your mode-seeking ability.

Finding the lowest point on a surface created in a random way by the computer is the game's object. The surface is "well-behaved" – there's only one valley. But the lowest point of that valley may be anywhere on the surface. You can ask for the elevation of the surface at any point you choose and use this information to home in on the minimum.

Indicate which points you wish to sample by using the Summagraphics Bit Pad as an x-y input device. An 11-inch square graphics tablet with a stylus, the Bit Pad can transmit the coordinates of selected points. This kind of input is more convenient than entering the coordinates of the point via keyboard, while less expensive than using a light pen with a refresh graphics tube.

Illustration by Richard Goldberg



For the sake of generality, the program is given here with an open input subroutine at line 8000. Code may be inserted here to input an x-y pair form the Bit Pad in the manner required by your particular BASIC system. If you do not have a Bit Pad, simply insert the line 8001 INPUT X,Y. In this case, you must type in the coordinates of the selected point instead of just pointing at it with the Bit Pad stylus.

The program first asks for a "point limit" (the maximum number of sample points you may test) and a "tolerance" (how close you must be to the correct answer to register success). Without this tolerance, you'd have to find the *exact* minimum, a practically impossible task. The program then internally defines a smooth function of two variables whose single minimum is chosen at random with the restriction that both coordinates of the minimum lie between 0 and 10 units. The actual value of the function at that point is also randomly determined.

Now the game starts. You repeatedly select points with your stylus, and the program prints out the functional value (elevation) of each point selected. This process continues until you've exceeded your point limit or you've found the correct minimum point to within the given tolerance. Your performance can be judged by how many steps it takes to find the minimum or by how close you get in a specified number of steps.

Clearly, this is a "bare bones" implementation. Use your imagination to design more elaborate scenarios and more competitive games on this theme.

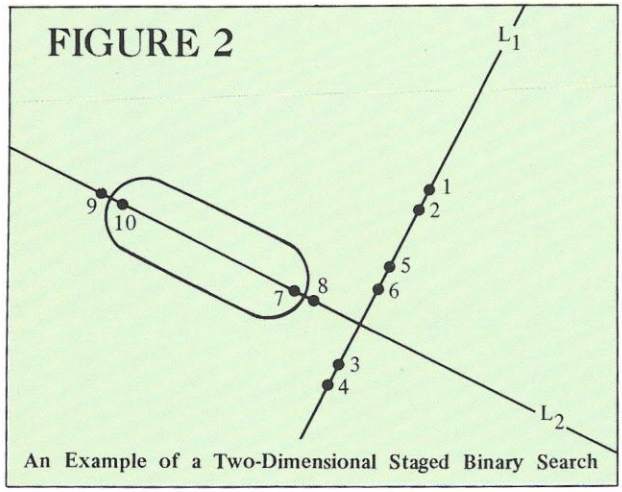
Strategies

Before tackling a difficult problem, it often helps to first analyze a simpler, special case. Consider the problem of finding the minimum of a function with just one input variable. We can represent such a function by graphing the input along the horizontal axis and the output along the vertical axis, as in Figure 1. According to the game's rules, you can ask what its height is at any point. Let's assume the function is smooth and has a single minimum which lies between 0 and 1.

Think of yourself as a bug crawling along the graph of Figure 1. If your front feet are lower than your back feet, the minimum lies somewhere in front of you; if your back feet are lower, the minimum lies behind you. What the bug actually does is test the slope of the line where he is. We can do this by inquiring about the graph's height at two points spaced close together.

For example, to determine graph's slope at x=0.7, we ask for the height at x = 0.699 and at x = 0.701. If the second point is higher, the slope is upwards and consequently the minimum lies somewhere between x = 0 and x = 0.701; if the first point is higher, then the minimum lies between x = 0.699 and x = 1. This operation of "testing slope at x =t" thus involves comparing the height of two points near t.

FIGURE 2



An Example of a Two-Dimensional Staged Binary Search

One way to apply your ability to test the slope is with the binary search method of finding the minimum. In this way twenty sample points may be used to find the minimum to within 1/1000 of a unit. Test the slope at x = 0.5. The answer automatically eliminates half the interfal from consideration; for example, if the slope is upwards, then the minimum must lie bwtween x = 0 and approximately x = 0.5. Repeat the process by testing the slope at the midpoint of the new interval.

Another technique, somewhat less efficient but more in line with the bug fantasy, is the method of steepest descent. Test the slope at some point on the graph. If the slope is upwards, take a step backwards; if the slope is downwards, take a step forwards. This procedure works fine except for deciding how big a step to take.

Mode-Seeking-Game Program

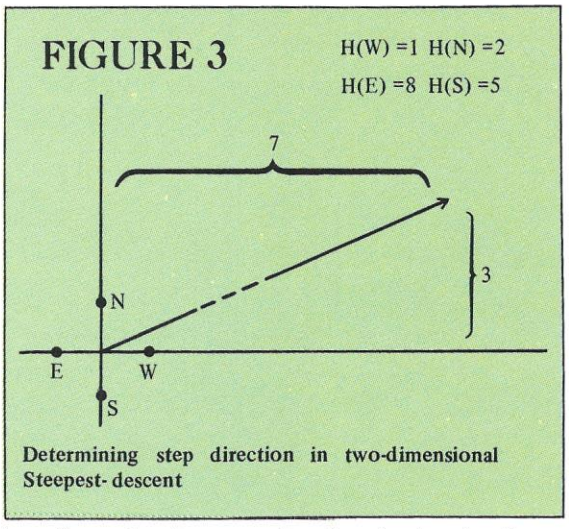
```
100 REM A MODE-SEEKING GAME
180 RANDOMIZE
190 DEF FNA(X,Y)=C*(X-A)**2+D*(Y-B)**2+R
195 REM FNA(X,Y) IS A PARABOLOID
196 REM WHICH HAS A MINIMUM VALUE OF R WHEN X=A AND Y=B
200 PRINT 'PLEASE ENTER POINT LIMIT, TOLERANCE'
210 INPUT M,E
220 LET A=RND(0)*10
240 LET B=RND(0)*10
250 LET R=RND(0)*1000
260 LET C=(RND(0)+.5)*30
270 LET D=(RND(0)+.5)*30
275 REM K COUNTS THE SAMPLE POINTS PICKED
280 LET K=0
290 LET K=K+1
300 IF K <=M THEN 400
310 PRINT 'YOU HAVE USED UP YOUR QUOTA OF POINTS'
315 PRINT 'MIN. VALUE IS';FNA(A,B);'AT X=';A;'  Y=';B
320 GO TO 9000
400 GOSUB 8000
405 REM PRINT VALUE OF SELECTED POINT
410 PRINT 'VALUE AT X=';X;' Y=';Y;' IS';FNA(X,Y)
415 REM Q IS THE DISTANCE FROM THE TRIAL POINT TO THE MIN. PT.
420 LET Q=SQR((X-A)**2+(Y-B)**2)
422 REM CHECK IF MIN HAS BEEN FOUND
425 IF Q>E THEN 500
430 PRINT 'VERY GOOD. YOU HAVE FOUND THE MIN IN';K;' STEPS'
440 GO TO 9000
500 PRINT 'YOU HAVE';M-K;' STEPS LEFT'
510 GO TO 290
8000 REM AT THIS POINT INSERT CODE TO GET X,Y FROM BIT PAD
                .          .          .
                .          .          .
8999 RETURN
9000 PRINT 'WANT TO TRY ANOTHER SURFACE?'
9005 INPUT A$
9010 IF A$='YES' THEN 200
99999 END
```

If the step is too large, the procedure may jump back and forth around the minimum without reaching it. If the step is too small, you may take an interminably long time to reach the minimum. In general, a good strategy is to decrease the step size as the search progresses.

With this one-dimensional foundation, we can return to the original problem as presented by the program. Both the binary and steepest descent methods generalize to two-dimensional surfaces.

One possible extension of the binary search method goes like this: Draw an arbitrary straight line on the Bit Pad tablet and use some of your allowed sample points to find the minimum along that line. Call the coordinates of this approximate minimum point (x_0, y_0). Now draw a line through (x_0, y_0) perpendicular to the original line and perform another search along this line, obtaining $(x_1 y_1)$ and conduct another search.

By continuing this procedure, you can approach the two-dimensional problem as a series of one-dimensional binary searches. Working with a well behaved surface, you can home in on the mode quickly, Such a strategy will allow you to perform consistently better than an opponent who chooses ample points at random.



Determining step direction in two-dimensional Steepest-descent

Figure 2 shows such a "staged binary" search using ten sample points. First, line L_1 is drawn on the Bit Pad at random, and points 1 and 2 are chosen near the middle of that line. The program then tells the elevation of the surface at each of those points. Denote the elevation of point 1 as h(1). In this case suppose you find that $h(1) > h(2)$; the minimum lies on the bottom half of the line.

Now bisect the bottom half with points 3 and 4. Finding that $h(3) < h(4)$ tells you the lowest point on the line lies between points 1 and 4. Since $h(5) > h(6)$, you know the lowest point lies somewhere between point 4 and 5. Now draw L_2 perpendicular to L_1 in the area in which you believe the lowest point of L_1 to be located and use four points to perform a similar search along L_2. In this case $h(7) < h(8)$ and $h(9) > h(10)$. You conclude that the minimum probably lies somewhere within the indicated oval.

The method of steepest descent can also be extended to two-dimensional surfaces in a natural way. Imagine you're a bug trying to descend into a valley. You're so nearsighted you can only see the terrain within an inch or so of your own feet. Find the lowest point within one inch of your present location and then take a hop in that direction. The length of the hop may be several inches, so you are depending upon the fact that the slope of the surface does not change radically just beyond your vision. Risks are involved in this "leap of faith" but it's better than simply jumping off in a random direction. If you repeat this process with suitable step ("hop") sizes, you should approach the minimum.

You can simulate this process with the Bit Pad. First pick any starting point (x_0, y_0). Now sample the elevation at 4 points to the North, East, South and West of the start point. These points, called N, E, S and W, should be very close to the start point. Now "hop" a distance h(S) -h(N) North and h(W) - h(E) East. If this hop seems too short or too long, you may vary its length but not its direction. Figure 3 shows an example of such a hop. Since h(S) -h(N) = 3 and h(W) -h(E) = 7, jump toward the point $(x_0 + 7, y_0 + 3)$.

Carrying out this steepest descent search requires more judgement than the binary method, since the step sizes must be chosen with skill. As in the one-dimensional case, it's best to start with a fairly large step size and decrease it gradually.

Two-dimensional techniques may fail if you pick a sufficiently strange function to search, but they are in general reliable heuristics. Experimentation with combinations and refinements of these techniques should give you a good feel for playing the mode-seeking game.

A Programmer's Approach to Chess

Test Tube Chess, by A. J. Roycroft. 370 pages with index, diagram retrieval key and more than 433 diagrams. Available for $12 post free from A. J. Roycroft, 17 New Way Road, London N.W. 9, England.

This book, subtitled "A Comprehensive Introduction To The Chess Endgame Study," was first published in 1972. I read this book some years ago and it appeared to be simply one more book of end game studies. However, John Roycroft, who has a professional interest in computers, had a programmer's approach in mind. He planned the book along that approach.

There is a vast difference between typical middle game situations and the end games. The middle game with its greater profusion of pieces and pawns is less complicated than the ending, because middle game tactics as well as ultimate strategies point out the proper path to follow. In the ending, on the other hand, the outcome is far less clear. Despite fewer pieces and pawns, the board is wide open and many possibilities are readily apparent, each of which must be analyzed. When masters and even grandmasters lose in the middle game, it is usually because of deeper strategies or sharper tactics by the opponent. When they lose in the ending, however, it is because even eminent grandmasters often "lose the thread of Ariadne in the labyrinth" of the ending, to quote a familiar observation. If this is true of grandmasters, what can be said of amateurs (in whose ranks we must include most computers at this time)?

Strangely enough, the ending, such a bugbear to humans, should be comparatively less difficult for computers. The middle game, on the other hand, usually the forte of humans, presents more problems to computers. Tedious checking of many game-line endings in the search tree, so tiring to the human brain, is not so for the computer in the end game. The human quickly recognizes a middle-game position as a familiar pattern. The computer however, explores hundreds of thousands of possibilities, including many futile exploratory lines that the human rejects at once.

Furthermore, end-game strategy is not as readily apparent as it is in the middle game. A glance at the problems in "Test Tube Chess" will quickly convince the reader of this fact. Therefore, it seems plausible that computers should shine in the end game. Surprisingly, though, very few have been programmed accordingly. No doubt this is because programmers have taught in the same way they've learned; to wit, the powers of the chess pieces, their moves, the opening, tactics and middle game. The end game has come almost as an afterthought. In addition, it must be pointed out that comparatively few computer games ever reach a recognizeable end game. Those that do are the exceptions; yet, they are products of the strongest chess programs.

As the general level of computer-play improves, more and more games will reach the ending. Those who get the jump by end-game-programming now will have a great advantage over their rivals. Many computers, for example, simply aren't programmed to solve mate-with-bishop-and-knight or queen-against-rook, and such games end in draws.

The advantage of starting out with the end game, says the author, is that the programmer quickly learns how well he is programming, since much of the theory is worked out. No computer can rise above the limits of its own programming; therefore, the programmer will find it advantageous to build a winning program. Teaching the computer end-game theory is a big step forward.

The computer should quickly pick up various patterns of endings with the aid of this book. For instance, the dust cover shows a "zwischenzug" problem (a waiting move or a "waiter.") Once learned, this becomes part of the machine's armament. There are many kinds of positions which require recognition, meat for the information storage system.

The classification on page 30, the bibliography on page 32 (of which I can recommend "1234 Endings" by Sutherland and Lommer) and "End-game Theory and the Computer" beginning on pages 219, are all valuable. Pages 280-282 demonstrate an interesting attempt at position classification. Included is a valuable nine-step program for analyzing endings which a programmer could find useful. The diagram retrieval key mentioned earlier I have seen nowhere else.

There is a great deal more to be found in the book: fascinating tidbits of chess history, ancient problems, and above all the beautiful problems themselves.

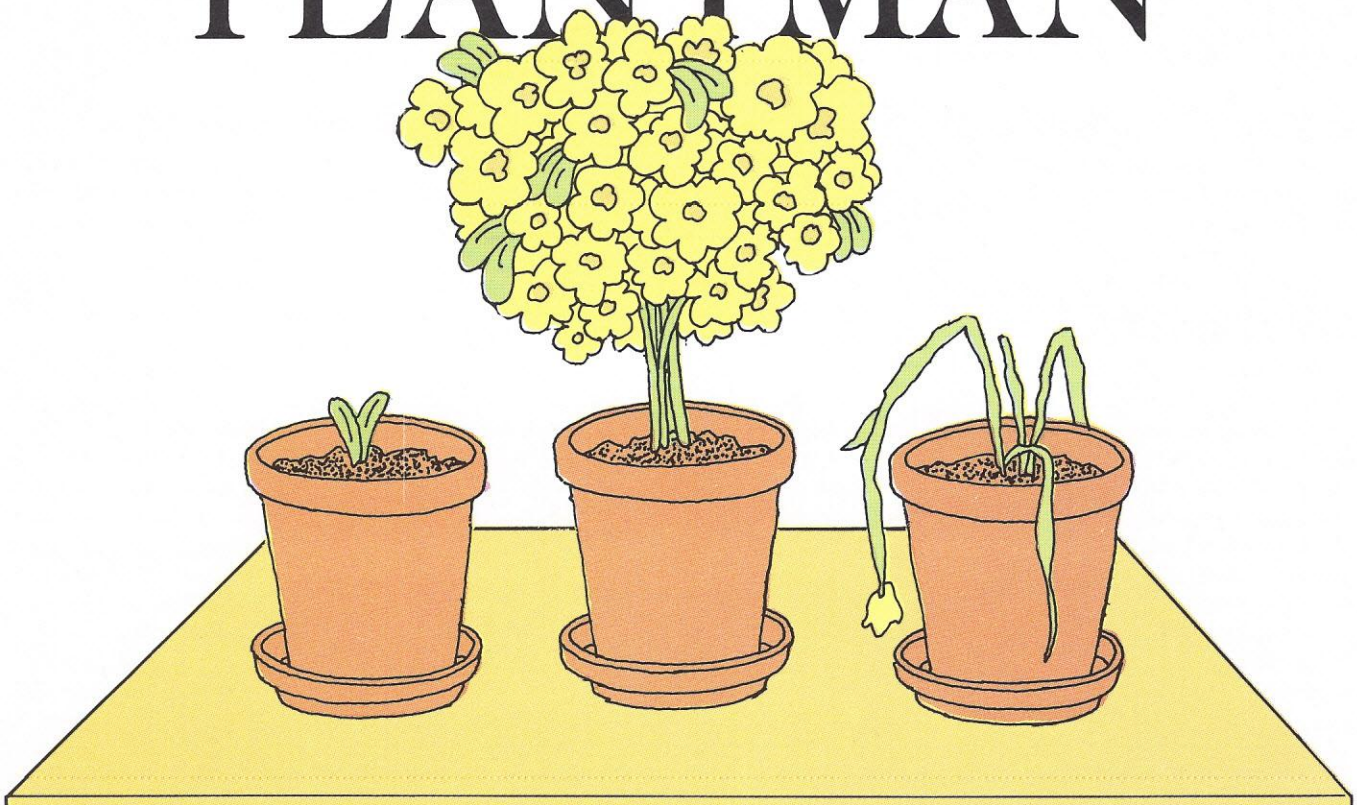
The author says: "There is not only a real possibility of computers making discoveries in end game theory, but this possibility borders on certainty and moreover has been a potentiality of computers for a number of years already. The computer is the ideal tool for solving tasks which humans find laborious and repetitive, and which, for these very reasons, cause human error." (Section II-2 of the book).

Further: "Actual composition of prize-winning end game studies by a computer program will be the last stronghold to be stormed by electronic attack, after a computer finally has beaten a World Champion." On the other hand, David Levy has been quoted as saying: "Without the ability to conceptualize, no program will ever play Grandmaster chess." Who is correct? Levy does not say computers will never "think", he merely gives it as a sine qua non for championship.

What is needed to make a computer "think"? Will simply feeding huge batches of information into the computer enable it to achieve thought by quickly recognizing patterns and selecting the best lines to follow? Will the "begin by experience" become the key to higher intelligence? Will the machine develop mental indigestion, like the human's headache and brain fag? We tread dangerously close to anthropomorphic thinking here. The answer must await the work of our indefatigable researchers. We must be patient. Look how long we waited for the appearance of the first volt of electricity.

– Reviewed by Morris Miller

PLANTMAN



BY PAT TANNER

What plant grows best in your humid yet sunny kitchen? Would a strawberry begonia or a zebra plant thrive better in that dark, empty corner of your living room? Maybe you like to look at plants but prefer not fiddling with them every day. What plant grows best when you water it only infrequently?

Plantman lets you answer these questions easily, choosing plants suitable to your own habits and personality and to conditions in your home. In addition, the program can supply you with care information for any specific plant on file.

Plantman operates in two modes:

(1) Plant growth needs; and
(2) Plants for your home.

After loading the program in, you decide which mode you want, enter its number and hit return.

If you choose mode 1, the computer prompts "Would you like a list of the available plants Y/N?" Answering yes lets you review the list of plants on file and find the number of the plant you are looking for. Enter the number into your computer, which responds with care information (light, water, atmosphere and temperature), plus the common and generic name of the plant. To get out of the mode, enter in any number greater than 76; you'll return to the original question of which mode you want.

Mode 2, "Plants for your home", is the most fun to use. It lets you choose an appropriate plant for any room in your home. First, you're asked to choose two light codes – ranging from shady to sunny – indicating the minimum and maximum light available in the room. For example, enter 2,4 to indicate semi-shady to indirect light. Or, you can enter the same light code twice – for example, 3,3 for a semi-sunny room.

Next come the water codes. Most people don't know which plants love water and which don't. They either water too much or too little. So enter two water codes reflecting how much you like to water your plants.

Follow the same format for the atmosphere codes, which indicate the humidity available in the room where the plant will live. A bathroom qualifies for the humid code. Normal room air goes under the room air code. However, if you are willing to spray your plant collection frequently and really stick to it, you should enter the humid code. So select the two codes that best match you and your home.

Plantman contains care information on 76 varieties of houseplants. Remember, though, that plants are adaptable to certain conditions that may be the exact opposite of the conditions they like best. You can change Plantman to suit your own particular needs. A plant shop, florist or greenhouse, for example, could enter plants used in its business. Or you could file information on your own personal collection of plants.

Plantman was written in Poly BASIC for a Polymorphic system with 16K memory. Backslash (\) separates multiple statements on a line. An exclamation point (!) indicates a print statement.

Sample Run

```
          * * * PLANT MAN * * *
PLANT GROWTH NEEDS=1
PLANTS FOR YOUR HOME=2

 * * * OPTION ? 2
 * * * LIGHT CODES * * *
1=SHADE
2=SEMI-SHADY
3=SEMI-SUNNY
4=INDIRECT
5=SUNNY

 * * * ENTER MIN,MAX CODE FOR YOUR ROOM 2,3
 * * * WATER CODES * * *
1=EVENLY MOIST
2=DRY
3=MODERATE, CAN'T DRY OUT
4=MODERATE LET DRY OUT
5=SEASONAL MORE IN SUMMER LESS IN WINTER
6=REST PERIOD NEEDED YEARLY
7=SPECIAL WATERING NEEDED

 * * * ENTER TWO WATERING CODES 1,5
 * * * ATMOSPHERE CODES * * *
1=HUMID
2=HUMID WITHOUT SPRAYING LEAVES
3=DRY
4=ROOM AIR
5=ANY

 * * * ENTER TWO ATMOSPHERE CODES 3,4
 * * * ENTER YOUR MIN,MAX
       ROOM TEMPERATURE 65,77

* * * I RECOMMEND THE FOLLOWING PLANTS * * *
 DRACENA M.-DRAGON TREE
 DIZYGOTHECA-FALSE ARALI
 CHRYSALIDOCARPUS-ARECA PALM
 SPATHIPHYLLUM-WHITE FLAG
 CALADIUM-ELEPHANT EARS
 SCHEFFLERA-UMBRELLA TREE
 HOWEIA-KENTIA PALM
 DRACENA S.-RIBBON PLANT
 CISSUS R.-GRAPE IVY
 PILEA C.-ALUMINUM PLANT
 ACALYPHA-CHENILLE PLANT
 * * * THAT IS ALL

 * * * 0=CONT. LIST OR 1=EXIT 1
          * * * PLANT MAN * * *
PLANT GROWTH NEEDS=1
PLANTS FOR YOUR HOME=2

 * * * OPTION ? 1
DO YOU WANT A LIST OF
AVAILABLE PLANTS ? Y/N N
PLANT CODE NUMBER ? 12

AGAVE P.-PRINCESS AGAVE
LIGHT: SEMI-SUNNY, INDIRECT, SUNNY
WATER: DRY
ATMOSPHERE: DRY
TEMPERATURE:  65

PLANT CODE NUMBER ? 25

PLATYCERIUM-STAG HORN FERN
LIGHT: SEMI-SHADY, SEMI-SUNNY, INDIRECT,
WATER: SPECIAL WATERING NEEDED
ATMOSPHERE: HUMID
TEMPERATURE:  65
```

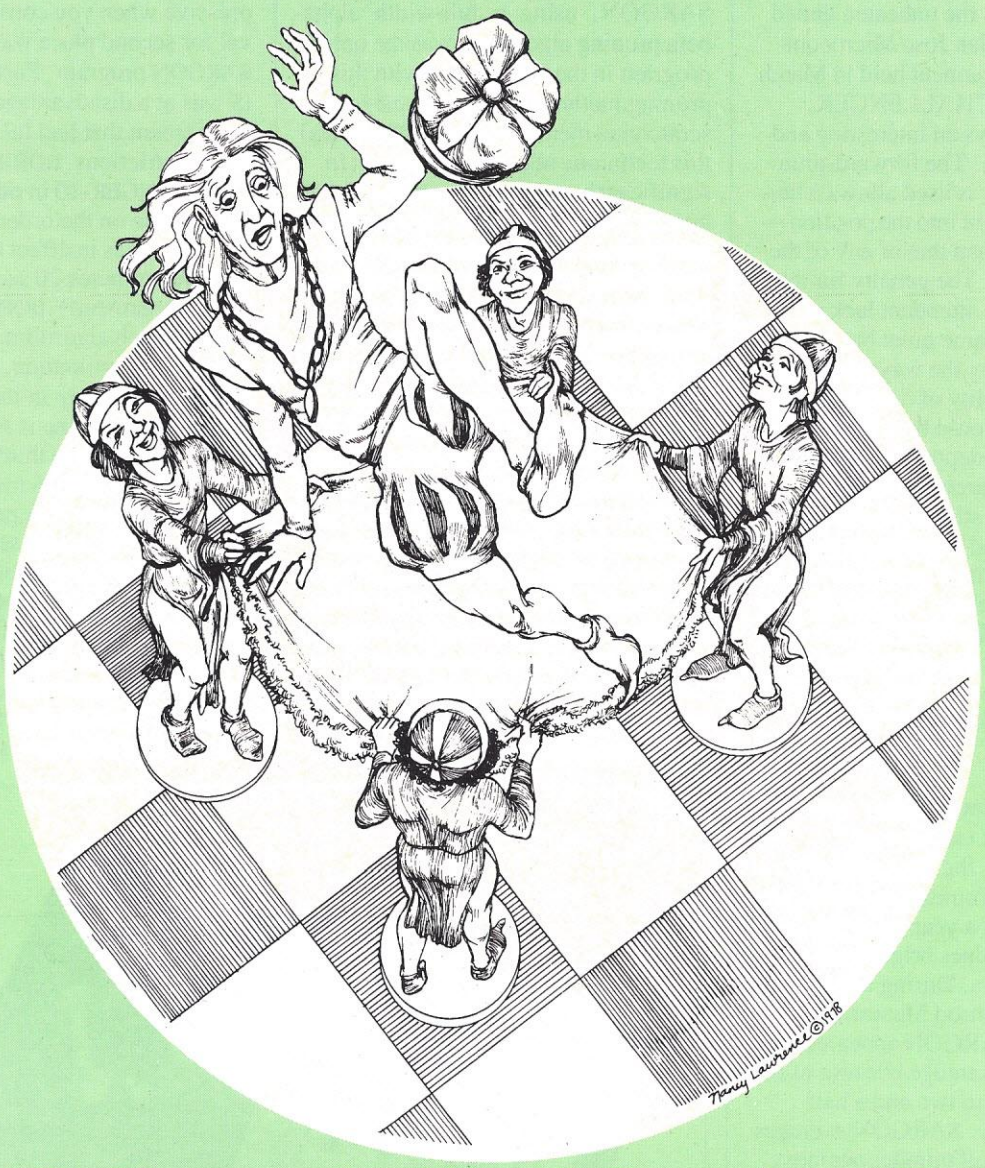
Program Listing

```
0 ************ PLANTMAN ***************
1 DATA"ARAUCARIA-NORFOLK ISLAND PINE",1,3,1,4,60
2 DATA"DIFFENBACHIA-DUMBCANE",2,4,4,4,60
3 DATA"MONSTERA D.-SPLIT LEAF PHILO",2,4,1,4,60
4 DATA"PHILODENDRON-HEART LEAF",2,4,1,4,60
5 DATA"SYNGONIUM P.-TRILEAF WONDER",2,4,1,4,60
6 DATA"TRADESCANTIA-WANDERING JEW",2,4,4,4,60
7 DATA"ALOE VERA-MEDICINE PLANT",2,4,4,3,60
8 DATA"CHLOROPHYTUM-SPIDER PLANT",2,4,1,4,60
9 DATA"DRACENA M.-DRAGON TREE",2,4,1,4,65
10 DATA"HAWORTHIA P.-PEARLY DOTS",2,4,2,3,60
11DATA"SANSEVIERIA T.-SNAKE PLANT",1,4,4,4,65
12DATA"AGAVE P.-PRINCESS AGAVE",3,5,2,3,65
13DATA"MARANTA-PRAYER PLANT",2,4,1,4,60
14DATA"PEPEROMIA O.-BABY RUBBER PLANT",2,4,4,4,65
15DATA"FICUS E.-RUBBER TREE",3,5,4,4,65
16DATA"CACTUS FAMILY",5,5,2,3,60
17DATA"AEONIUM-PINWHEEL SUCCULENTS",2,5,4,3,60
18DATA"TOLMIEA-PIGGY BACK PLANT",2,4,1,1,60
19DATA"DIZYGOTHECA-FALSE ARALI",2,4,1,4,65
20DATA"HEDERA H.-ENGLISH IVY",2,4,1,4,60
21DATA"SAINTPAULIA-AFRICAN VIOLET",2,4,1,4,60
22DATA"GYNURA-PURPLE PASSION",3,5,1,4,60
23DATA"FATSIA-JAPANESE ARALIA",2,4,1,4,55
24DATA"ADIANTUM R.-MAIDENHAIR FERN",2,4,1,1,65
25DATA"PLATYCERIUM-STAG HORN FERN",2,4,7,1,65
26DATA"CHRYSALIDOCARPUS-ARECA PALM",2,4,1,4,65
27DATA"SPATHIPHYLLUM-WHITE FLAG",2,4,1,4,65
28DATA"ASPARAGUS SPRENGERII",2,4,4,4,60
29DATA"YUCCA TREE",3,5,4,3,60
30DATA"CODIAEUM-CROTONS",3,5,3,1,65
31DATA"CISSUS A.-KANGAROO VINE",2,4,4,4,60
32DATA"SAXIFRAGA-STRAWBERRY BEGONIA",3,5,4,4,55
33DATA"COLUMNEA M.-GOLDFISH",2,4,4,2,65
34DATA"AESCHYNANTHUS-LIPSTICK VINE",2,4,1,1,65
35DATA"FITTONIA-NERVE PLANT",2,4,1,1,65
36DATA"COLEUS",3,5,3,4,60
37DATA"PLECTRANTHUS A.-SWEDISH IVY",2,4,4,4,60
38DATA"HOYA-WAX VINES",2,4,4,4,60
39DATA"LITHOPS-STONE PLANTS",3,5,4,3,65
40DATA"BEGONIA M.-IRON CROSS",2,4,1,1,60
41DATA"CALADIUM-ELEPHANT EARS",2,4,1,4,65
42DATA"SCHEFFLERA-UMBRELLA TREE",2,4,1,4,65
43DATA"CEROPEGIA-ROSARY VINE",2,4,4,4,65
44DATA"BROMELIAD FAMILY",2,5,7,4,60
45DATA"MAMMILLARIA CACTUS",3,5,2,3,60
46DATA"RHOEO-MOSES IN THE CRADLE",3,5,1,4,60
47DATA"PODOCARPUS",3,5,1,4,60
48DATA"HELXINE-BABY TEARS",2,4,1,1,60
49DATA"PILEA M.-ARTILLERY PLANT",2,4,4,1,65
50DATA"CRASSULA A.-JADE PLANT",3,5,4,4,60
51DATA"KALANCHOE",3,5,4,4,60
52DATA"ECHEVERIA-CHICK & HENS",3,5,2,4,60
53DATA"SEDUM-JELLY BEANS",3,5,2,4,60
54 DATA"ZEBRINA-INCH PLANTS",2,4,4,4,60
55DATA"CALATHEA Z.-ZEBRA PLANT",2,4,1,1,65
56DATA"PEPEROMIA C.-EMERALD RIPPLE",2,4,4,4,65
57DATA"FICUS B.-WEEPING FIG",3,5,4,4,65
58DATA"BOWIEA-CLIMBING ONION",2,4,4,4,60
59DATA"POLYSCIAS F.-MING ARALIA",3,5,1,4,65
60DATA"MIMOSA P.-SENSITIVITY PLANT",3,5,1,4,65
61DATA"SCILLA-SILVER SQUILL",2,4,1,4,60
62DATA"HEMIGRAPHIS-PURPLE WAFFLE",1,3,1,1,65
63DATA"ABUTILON-FLOWERING MAPLE",3,5,1,4,60
64DATA"DAVALLIA S.-RABBIT FOOT FERN",2,4,1,1,65
65DATA"HOWEIA-KENTIA PALM",2,4,1,4,65
66DATA"BEAUCARNEA-PONY TAIL PALM",3,5,1,4,65
67DATA"DRACENA S.-RIBBON PLANT",2,4,1,4,65
68DATA"CISSUS R.-GRAPE IVY",2,4,1,4,65
69DATA"SENECIO M.-WAX IVY",2,5,4,4,60
70DATA"GIBASIS-TAHITIAN BRIDAL VEIL",3,5,4,4,60
```

```
71DATA"AECHMEA F.-SILVER VASE B",2,4,7,4,60
72DATA"PILEA C.-ALUMINUM PLANT",2,4,1,4,65
73DATA"EUPHORBIA S.-CROWN OF THORNS",2,4,4,4,65
74DATA"RUELIA M.-MONKEY PLANT",2,4,1,1,65
75DATA"BEGONIA E.-WATERMELON",2,4,1,4,60
76DATA"ACALYPHA-CHENILLE PLANT",2,4,1,4,65
180T1=76
185 P1=7
190DIMA$(50)\S$=" * * * "
200 !CHR$(12),TAB(15),S$,"PLANT MAN",S$\RESTORE
210 !"PLANT GROWTH NEEDS=1"\!"PLANTS FOR YOUR HOME=2"
225 !
230 !\!S$,\INPUT"OPTION ? ",I
240IFI=2THEN2000ELSEIFI<>1THEN230
260 INPUT"DO YOU WANT A LIST OF AVAILABLE PLANTS ? Y/N ",I$
270IFI$="Y"THEN1000ELSEIFI$<>"N"THEN260
290 INPUT"PLANT CODE NUMBER ? ",I
300IFI<1THEN1000ELSEIFI>T1THEN200ELSERESTORE
330 FORI1=1 TO I\GOSUB1130\NEXT\!\!A$\!"LIGHT: ",
420 IF C1<2THEN!"SHADY, ",
450 IF C1<3THENIFC2>1THEN!"SEMI-SHADY, ",
480 IF C1<4THENIFC2>2THEN!"SEMI-SUNNY, ",
510 IF C1<5THENIFC2>3THEN!"INDIRECT, ",
540IFC2>4THEN!"SUNNY",
560 !\!"WATER: ",\IF C3=1THEN!"EVENLY MOIST"
590IFC3=2THEN!"DRY"ELSEIFC3=3THEN!"MODERATE, CAN'T DRY OUT"
610 IF C3=4THEN!"MODERATE LET DRY OUT"
620IFC3=5THEN!"SEASONAL, MORE IN SUMMER, LESS IN WINTER"
630 IF C3=6THEN!"REST PERIOD NEEDED YEARLY"
640IFC3=7THEN!"SPECIAL WATERING NEEDED"
645!"ATMOSPHERE: ",\IFC4=1THEN!"HUMID"
650IFC4=2THEN!"HUMID WITHOUT SPRAYING LEAVES"ELSEIFC4=3THEN!"DRY"
680IFC4=4THEN!"ROOM AIR"ELSEIFC4=5THEN!"ANY"
710 !"TEMPERATURE: ",C5\!\GOTO290
1000 !CHR$(12),"CODE          PLANT"\RESTORE\L=1
1010 FORI1=1TOT1\GOSUB1130\!I1,"------",A$\L=L+1
1050 IFL=14THEN1070
1060 NEXT
1070!\!S$,\INPUT"0=CONT. LIST OR ENTER PLANT NUMBER ",I
1090IFI<>0THENEXIT300ELSEIFI1>T1THENEXIT1000ELSEL=1\GOTO1060
1130 READ A$,C1,C2,C3,C4,C5\RETURN
2000 !CHR$(12),S$,"LIGHT CODES",S$\!"1=SHADE"
2020!"2=SEMI-SHADY"\!"3=SEMI-SUNNY"\!"4=INDIRECT"\!"5=SUNNY"\!
2050!S$,\INPUT"ENTER MIN,MAX CODE FOR YOUR ROOM ",I1,I2
2070 IFI2>=I1THENIFI1>0THENIFI2<6THEN2110
2080GOTO2050
2110 !CHR$(12),S$,"WATER CODES",S$\!"1=EVENLY MOIST"
2130 !"2=DRY"\!"3=MODERATE, CAN'T DRY OUT"
2150 !"4=MODERATE LET DRY OUT"
2160 !"5=SEASONAL MORE IN SUMMER LESS IN WINTER"
2170 !"6=REST PERIOD NEEDED YEARLY"
2180 !"7=SPECIAL WATERING NEEDED"\!\!S$,
2190 INPUT"ENTER TWO WATERING CODES ",I3,I5
2200 IFI3>0THENIFI3<8THENIFI5>0THENIFI5<8THEN2220
2210 GOTO 2190
2220 !CHR$(12),S$,"ATMOSPHERE CODES",S$\!"1=HUMID"
2240 !"2=HUMID WITHOUT SPRAYING LEAVES"\!"3=DRY"
2260 !"4=ROOM AIR"\!"5=ANY"\!\!S$,
2280INPUT"ENTER TWO ATMOSPHERE CODES ",I4,I6
2290 IFI4>0THENIFI4<6THENIFI6>0THENIFI6<6THEN2305
2300 GOTO 2280
2305!CHR$(12),S$,\INPUT "ENTER YOUR MIN,MAX ROOM TEMPERATURE ",I7,I8
2330 IFI7>I8THEN2305
2400 !CHR$(12),TAB(7),S$,"I RECOMMEND THE FOLLOWING PLANTS",S$
2410 RESTORE\L=1
2420FORI=1TOT1\GOSUB1130\IFC1>I1THEN3000
2430IFC2<I2THEN3000ELSEIFI3=C3THEN2440ELSEIFI5<>C3THEN3000
2440IFI4=C4THEN2450ELSEIFI6<>C4THEN3000
2450IFC5<I7THEN3000ELSEIFC5>I8THEN3000
2460 !A$\L=L+1\IFL=14THEN3020
3000 NEXT
3010 !S$,"THAT IS ALL"
3020 !\!S$,\INPUT"0=CONT. LIST OR 1=EXIT ",I9
3030IFI9>0THENEXIT200ELSEIFI>T1THENEXIT2400ELSEL=1\GOTO3000
3050 END
```

COMPUTER CHESS
including
COMPUTER CHECKERS

HARRY SHERSHOW – Dept. Editor
MORRIS MILLER – Chess Annotater



Chess Challenger-10 Wins Microchess Tourney

by Don Gerue and Russ McNeil
(It was sadly coincidental that Doug Penrod died November 12, 1978, at the same time that this tournament was being completed.)

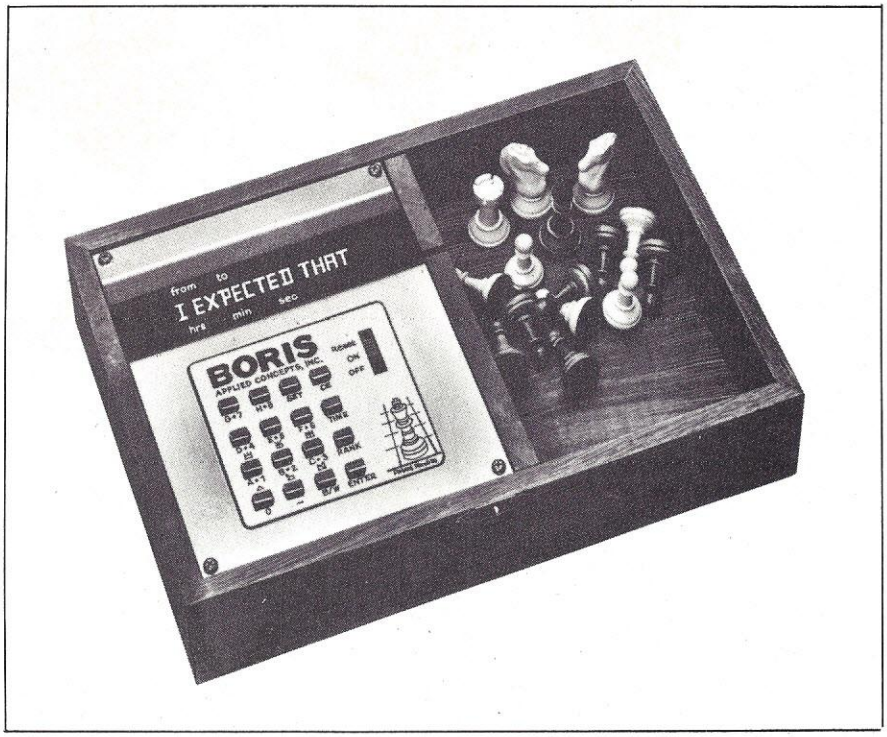
The first phase of this tournament has been completed and CHESS CHALLENGER 10 emerged as the easy victor with ten wins, two draws and no losses. SARGON I was second with six wins five draws and one loss. BORIS finished third with seven wins, two draws and three losses, and its claim to fame was that it was the only one able to beat SARGON. The complete, final standings are shown in tables below. With the exhausting tournament out of the way, for the present, we are now taking a well deserved rest. We understand that fresh and upgraded programs are on their way for evaluation in the Second Annual PENROD MEMORIAL CHESS TOURNAMENT, and our vacation may be cut short. But before the second tournament begins, BORIS and CHESS CHALLENGER 10 are scheduled to take a trip to San Diego. There, an exhibition match has been scheduled with SARGON II. The Atari chess program's arrival had been delayed for the tournament. Rather than postpone the conclusion of the tournament we have rescheduled a supplementary play for Atari against the other contestants. Reports on Atari's talents will appear here later. We welcome any suggestions readers have as plans get underway for the second microchess tournament. Write to: Don Gerue at 3667 Montalzo Way, Santa Barbara, CA 93105. If you are soliciting a personal response please enclose a stamped, return envelope.

The winner of the first annual tournament, CHESS CHALLENGER 10

lost none of the twelve games played and drew only two. Both draws were against SARGON I. This is a nice feat on the part of CC 10 because SARGON I, as you know, is the unbeaten untied champion of the San Jose Microcomputer Chess Tournament held in March of last year. The CHALLENGER, upon analysis plays an interesting and competitive game. The forward-pruning algorithm that is used allows a limited four-ply insight into the position — which is deeper than that of any of the other contestants. The penalty for this deeper look is the attendant lack of breadth and lets some quiet but effective moves drop by the wayside. There is also the possibility of overlooking a sacrifice which would be effective within the search depth. To have the luxury of deep search and full width simultaneously is still the exclusive territory of larger and faster programs. The team at Fidelity Electronics can be proud of their machine. We should also mention CHALLENGER's fine, magnet-weighted wooden pieces and the excellent chessboard. Both look durable enough to take a lot of banging around for years."

The second-place winner was SARGON. What can you say? SARGON swept the San Jose Microcomputer Chess Tournament in March, 1978. It is almost a year since then and SARGON still shines brightly among newer competitors. During the games played at the "Penrod Memorial Tournament" SARGON appeared to be at some disadvantage because of the rule of 40 moves in two and a half hours. At two-ply, SARGON averages about one and a half minutes per move. At three ply ten minutes or more were needed. Both CHALLENGER-10 and SARGON use a Z80 processor. SARGON operating on the TRS 80 uses a clock speed of 1.77 MHz, while CHALLENGER-10 runs at 4 MHz. Even with the timing difference, SARGON was able to draw against CHALLENGER-10 in the two times they faced each other. To be fair about this, though, SARGON has relatively unlimited scratchpad memory while CHALLENGER-10 is restricted to a mere 512 Bytes. It is our opinion, however, that SARGON is a fine program that can hold its own in today's competition. In November, 1978, SARGON was made available in cassette form for the TRs-80. It currently sells for $19.50. If you own a TRS-80, you have a great value available. SARGON, using a full-width alpha-beta pruning algorithm, was the only program in the tournament with this pruning method. While expensive in scratchpad memory (about 2000 Bytes) this technique allows the program to significantly reduce the number of boards it has to examine. The program guarantees, at the terminal end of the search, that no better move could have been found at that ply depth if *all* boards had been evaluated. This is the same method used by all of the big boys such as World Champion CHESS 4.7. If you don't have a TRS-80, Level II, then you will either have to acquire one for a measly thousand bucks, or else, if you have spent $19.95 for the tape, you can listen to the binary load on your hi-fi — a rather unsatisfactory alternative. On the other hand, you could buy the complete program source code and description in book form for only $14.95. Then you can spend an enjoyable afternoon installing the program in any handy Z 80-based host computer.

The third place winner, BORIS, finished the tournament in third place. However, it was very close to second throughout the match. This is most impressive when you consider that its rival for second place was the strong SARGON program. Furthermore, BORIS was at a disadvantage to be in a tournament that had full championship time-restrictions. BORIS has beaten CHALLENGER-10 in other matches where time on the order of one minute per move was in effect (as opposed to the three minutes 20 seconds time in this tournament.) BORIS uses a full-width search algorithm. After finishing a one-ply examination, BORIS begins on the second ply in the order of first-ply ranking. If time is still available, BORIS starts on the third ply. Within its search depth, BORIS misses no potential good moves. The penalty, of course, for full-width search is sacrifice of time. BORIS, when it runs out of time, cannot go into deeper searches and this leads to lack of insight into a current position. The BORIS program used in this tournament was approximately 40% faster than the 1978 model. The internal electronics, except for a



Chafitz, Inc., of Rockville, MD, has two new models of BORIS. Both are battery operated and both can be adjusted to play at various levels of chess skill. Both models know all classic chess rules and can solve any mate-in-two problem. "BORIS MASTER" operates for 8 hours on rechargeable batteries. His special "Position Storage Memory" holds board positions for up to one week, allowing games to be interrupted and resumed during that time. "BORIS, JR." operates for more than 10 hours on AA batteries. Retail prices start at $99.95.

new PROM program, remain the same. How this will change when CHESS 4.7 programmers, David Slate and Larry Atkin upgrade the program, remains to be seen. BORIS is a nicely packaged unit and has the best position-examination set up of any of the stand-alone devices. It is as good in this respect as SARGON, a program blessed with much more memory and a video display. The wise-crack comments are gassers even though they appear at random. BORIS is the only program with this entertaining feature. All in all, it is one of the finest stand-alone devices available.

The fourth place winner, MICRO-CHESS 2.0 is, of course, the veteran in the group. When others were still dreaming of playing chess on home computers, Peter Jennings already had his first 8080-based program on sale. His programs demonstrate that experience is an excellent teacher. Although not finishing among the leaders of the tournament, MICROCHESS 2.0 plays a creditable game. It is quick to respond and boasts of features that no other program can match. One item, that is real handy, is a pair of accurate clocks on the display screen that keeps track of both its own and its opponents' moves. These clocks also serve to comfort the human player by showing him that the computer is really doing something and has not quit cold on him, right in the middle of a move. The graphics on the PET computer are very good and proves that the PET is a particularly compact and useable home comptuer. Newer adaptations of MICROCHESS 2.0 provide joy sticks for controlling piece motion. Microtonics, Inc. will soon have this modification available. After playing chess on Atari, which has joysticks, we feel that joysticks are a convenient and intuitive way to play. Makes you feel that you are actually picking up a chess piece and moving it, rather than simply pressing a series of buttons. All in all, Peter Jennings program has much to commend it and the price of $19.95 is quite reasonable, especially if you have a PET computer available.

Next month we will have the results of the special match of SARGON II against BORIS and against CHESS CHALLENGER 10. We are not looking for a winner here. Rather we are seeing an insight into the future. A look at the new, upgraded SARGON II may well indicate the performance levels we may expect from the 1979 tournament contestants. The December North American Computer Championship chess-match took place in Washington one week after our get together with SARGON II. The SARGON program, together with MIKE from Europe, were the only two microcomputer chess programs admitted to this tournament. We will be comparing these results of SARGON's performance at Washington with those of the two machines.

It will be interesting to see how these chess programs perform in our next annual tournament. Hopefully we will have Compu-Chess and other new programs so that we can include them in the report. We don't expect the same programs to win all the time. Like human chess players, computer programs are constantly improving their lines of play, constantly learning. The losers of today are tomorrow's champs, and Korchnoi gives way to Karpov.

He Dwelt in Courage . . .

Doug Penrod, founder of the first regular, formal, computer-chess publication in the world, died at his home in Santa Barbara, CA, in November 1978. In the last Computer Chess Newsletter that he wrote, he had the following thoughts:

Due to terminal cancer (Diffuse Histiocytic Lymphoma) that started in January 1975, I am transferring the Computer Chess Newsletter to the monthly magazine Personal Computing.

Founding the Computer Chess Newsletter has been a great pleasure for me, though a lot of work, and I hope to help with it as long as I am able. I apologize for the delays and other defects. I expect the newsletter to be useful to both those who are pushing the state of the art at the professional level in the universities, and to the growing army of hobbyists who are just learning about it. I trust that the experienced computer chess programmers will continue to write about it both for their mutual benefit, providing communication to advance the state of the art, and to write tutorial articles for the benefit of those who are trying to write their first program. I look forward to the publication of completely documented programs, modularly constructed for easy modification by the experimenter.

Penrod's remarkable personal courage is shown in the following lines extracted from a letter received from him in April of this year:

24 April 1978

On January 12, my radiologist told me that I might have only a couple of months to live, meaning about March 12. So I decided to have a funeral party rather than a funeral — much more fun to attend live than dead — and I had one, March 24 through 26, with a maximum attendance at one time of 17. Evan Forman came all the way from Mobile, Alabama. He is a CCNL reader, and had talked to me on the phone from time to time. A marvelous time was had by all. It was such a good idea that I might have another one next year. Right now I'm undergoing a 6 period, 4 weeks per period, chemotherapy treatment, which has everything under control for now. The treatment will continue 8 more weeks.

Adios . . . . . Doug Penrod

Final Results

	CONTESTANTS		OPPONENTS #1	2	3	4	5	6	7	8	9	Games Won	Games Drawn	Games Lost	FINAL SCORE	FINAL POSITION
1	MICRO-CHESS 1.0 (Heath H-8)	W		½	Ø	1	Ø	Ø	Ø			1	3	8	2½	7*
		B		½	½	Ø	Ø	Ø	Ø							
2	MICRO-CHESS 1.5 (TRS-80)	W	½		½	½	Ø	Ø	Ø			Ø	5	7	2½	6*
		B	½		Ø	Ø	Ø	½	Ø							
3	MICRO-CHESS 2.0 (PET)	W	½	1		1	Ø	Ø	½			3	4	5	5	4
		B	1	½		½	Ø	Ø	Ø							
4	CHESS CHALLENGER (3 Level)	W	1	1	½		Ø	½	½			2	5	5	4½	5
		B	Ø	½	Ø		Ø	Ø	½							
5	CHESS CHALLENGER (10 Level)	W	1	1	1	1		1	½			10	2	Ø	11	1
		B	1	1	1	1		1	½							
6	BORIS	W	1	½	1	1	Ø		1			7	2	3	8	3
		B	1	1	1	½	Ø		Ø							
7	SARGON I (TRS-80)	W	1	1	1	½	½	1				6	5	1	8½	2
		B	1	1	½	½	½	Ø								
8	ATARI	W														
		B														
		W														
		B														

* Note: Microchess 1.5 wins 6th place over Microchess 1.0 by virtue of the tie breaking analysis of relative strength of opponents

Statistics on Contestants

	CPU	Clock Speed (MHz)	ROM Size in Bytes	RAM Size in Bytes	Host Computer	Media	Price	Available	Pruning
MICRO-CHESS 1.0	8080A	2	–	3K	Any 8080 Based Computer. Tournament Run on Heath H-8	Object Code Listing	19.95	1977	Full Width 2 Ply at Normal Speed
MICRO-CHESS 1.5	Z80	1.77	–	4K	Radio Shack TRS-80 Level 1 or 2 - 4K	Cassette	19.95	1978	Same as Above but Level 3
MICRO-CHESS 2.0	6502	1	–	4K	Commodore PET or APPLE	Cassette	19.95	1978	Full Width 2 Ply Improved Evaluation
CHESS CHALLENGER (3 Level)	8080A	2	4K	512	Stand Alone Device	–	150 to 200	1978	Forward Pruning
CHESS CHALLENGER (10 Level)	Z80	4	4K	512	Stand Alone Device	–	200 to 275	1978	Forward Pruning
BORIS 1979 Model	F8	2	3K	512	Stand Alone Device	–	300	1979	No Pruning. Full Width Exhaustive Search
SARGON I	Z80	1.77	–	8.5K	Radio Shack TRS-80 Level II - 16K	Cassette or Source Listing	19.95	1978	Alpha Beta Pruning
ATARI CHESS	6507/ 6500	1.2	4K	256	ATARI Home Video Computer	ROM Cartridge	30 - 40	1979	Alpha Beta Pruning

Conclusions

MICRO-CHESS 1.0: Capture Variations to 6 ply at normal speed.

MICRO-CHESS 1.5: Same as above at Level 3.

MICRO-CHESS 2.0: Considerable improvement in Algorithms of MC 1.5.

CHESS CHALLENGER: At level 10 (used for tournament forward pruning chooses:
Best 24 moves at ply 1 for further evaluation
Best 16 moves at ply 2 for further evaluation
Best 4 moves at ply 3 for further evaluation
Evaluates all resulting moves at ply 4
(Total of 50,000 boards per move.)

BORIS: Orders looks at upper plys by minimax sort. Plays 2 ply plus at 3 min 20 sec per move (used for tournament).

SARGON I: Set for 2 ply in tournament. Plays 40 moves in 1½ hours.

ATARI: The programmer predicts it will play 3 ply plus in 3 min. 20 sec average move time.

Levy at Toronto – The Historic Fourth Game

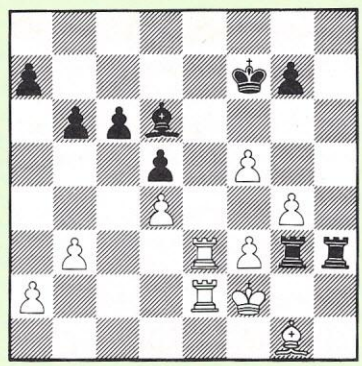
When David Levy went to Toronto to tangle with World Champion CHESS 4.7, there was a little hoop-la before the match. Almost like a Muhammed Ali fight where the champ makes wise cracks, to weaken his opponent, Dave Cahlander told Levy: "We have a secret program all lined up for you!" "Sure you have," retorted Levy, who is reputed to have an exterior as tough as Wilkinson steel. "You're trying to get me worried, just like in the Korchnoi-Karpov game. But it won't work. I'm confident I'll win." Sporting a tuxedo, Levy sat in a glass, soundproofed, air-conditioned booth. He played on Control Data's new electronic chess board which fed his moves directly into the computer situated in Minneapolis. Help from a human intermediary was not needed.

When the fourth game began, Levy was ahead 2 1/2-1/2 and needed only one more game to win his bet. "He indicated to me," Dave Cahlander later said, "that he was willing to take on the program on its own game tactics. In the fourth game, then, he selected the 'Crash-Smash Gambit' that is used by one of Toronto's street players, Josef Smolij. The machine is not hooked up on this Latvian Gambit but was willing to slug it out. By the 38th move, Levy appeared to have an advantage of 2 passed pawns. But the program look-ahead saw that *the machine* actually had an advantage of 2+ pawns. By the 56th move, the outcome of the game was clear and CHES 4.7 went on to win the first game of its match. A computer had finally beaten a human in a regular match game!"

White — **CHESS 4.7**
Black — **DAVID LEVY**

1.	P-K4	P-K4
2.	N-KB3	P-KB4
3.	PxP (a)	P-K5
4.	N-K5	N-KB3
5.	N-N4 (b)	P-Q4
6.	NxN+	QxN
7.	Q-R5+	Q-B2
8.	QxQ+	KxQ
9.	N-B3	P-B3
10.	P-Q3	PxP
11.	BxP	N-Q2 (c)
12.	B-KB4	N-B4
13.	P-KN4	NxB+
14.	PxN	B-QB4
15.	O-O	P-KR4 (d)
16.	N-R4	B-Q5
17.	B-K3	B-K4 (e)
18.	P-Q4	B-Q3
19.	P-KR3 (f)	P-QN3
20.	KR-K1	B-Q2
21.	N-B3	PxP
22.	PxP	R-R5
23.	P-B3	QR-R1
24.	K-B1	B-N6
25.	R-K2	B-B1
26.	K-N2	B-Q3
27.	B-N1	R-R6
28.	R(QR1)-K1	R-N6+
29.	K-B2	R(R1)-R6
30.	R-K3	B-R3
31.	N-K2	BxN
32.	R(K1)xB (g)	P-B4 (h)
33.	P-B4 (j)	RxR
34.	RxR	R-R5
35.	K-N3	R-R8
36.	B-B2	R-Q8
37.	R-R3	PxP
38.	RxP+	K-B1
39.	R-Q7	R-Q6+
40.	K-N2	B-B4
41.	RxQP	R-R7
42.	P-N4	BxP (k)
43.	R-Q8+	K-B2
44.	R-Q7+	K-B1
45.	RxP+(m)	R-N7
46.	K-B3 (n)	B-B4
47.	R-Q8+	K-K2
48.	B-R4+	K-B2
49.	P-N5+ (o)	P-N3
50.	R-Q7+	K-B1
51.	PxP	RxP (p)
52.	P-B5	R-R6+
53.	K-N4	R-R5+

Position after White's 32nd move



Annotations by Morris Miller.

(Because this is the historic "first game" won by a computer in a regularly-scheduled match, Morris scrutinizes the logic of the moves a little closer.)

a) The Greco Counter Gambit. Niezowitsch, as White, played NxP; P-Q4; N-B4; NxK3; B-B4; B-N3 and after Black's response of P-QB4, White was able to bring down Black's center.

(b) Would not 5. P-Q3 gain a tempo? If 5 . . . P-Q3; 6. N-N4, P-Q4. White has the additional move of P-Q3.

(c) It is interesting to note that CHESS 4.7 had predicted from 11 . . . N-Q2 through 13. P-KN4, but then went off on a tangent by predicting 13 . . . K-N1

(d) Levy decides to open the KR file for a King side attack, but this will have more strategic than tactical menace without Queens.

(e) A surprise to CHESS 4.7 which had predicted an exchange by Levy and PxP.

(f) Better than P-B3, which would loosen the King file. CHESS 4.7 believes it can weather the opening of the KR file.

(g) The position has been fairly complicated and it is difficult to see how Levy could have improved his play. He is a Pawn down now, and every exchange helps the computer.
(h) CHESS 4.7 cannot play 33. PxP, BxP.
(j) At this point an interesting variation develops that Levy failed to notice. He cannot play 33. . . . BxP; 34. R-K7+ K-B3? 35. R(K2)-K6+ K-N4; 36. RxKNP+ K-R5; 37. R-R7+ K-N4; 38. R-KN6 mate. But after 34. R-K7+ K-N; 35. RxRP? Black can win by R-K6+ or even the effective 35 . . . PxP! because the White Bishop is now trapped: Also, 34. R-K7+ K-N; 35. K-B1 R-R8; 36. R-N2 PxP! and again the Bishop will be lost by Black's next move of B-K6. Several other variations, all leading to Black wins, are apparent. It's a pity that Levy overlooked this line of play.
(k) And now 43. RxP RxB+; 44. KxR B-B4; and then 45. K-K3 wins easily.
(m) CHESS 4.7 now sees it.
(n) The threat was B-B4.
(o) Threatening mate.
(p) Another chess saying: "A dying man can eat anything."
(q) Even 55. RxR leads to a win.
(r) For instance: 56 . . . B-Q1 or Q3; 57. P-N7+ K-N1; 58. K-N6 etc.

Conclusion: Levy had a win practically in his grasp but, possibly fatigue set in. Nevertheless, a most impressive showing by CHESS 4.7 in this historic, first, computer victory in a regular tournament. Levy, in his own defense, says this was really a scientific experiment for him. He says he was trying to play the computer with its own strategy and tactics.

Romanian Struggle

. . . . . Having reached the 26th move, as shown below, Felix 256, running the program of ASTRO 64 against the readers of the Bucharest newspaper, Magazinul, appears to be running out of wind. That is the consensus of opinions of chess players who have been studying this Roumanian struggle. The computer simply is beginning to weaken and yield to the unwavering offense of the readers. This supports the theory of psychologists who say that the computer can beat a human opponent, on a man-to-man basis because the human yields to psychological pressures around him, while the computer, with its shielded integrated circuits, is immune to such emotions. That is why you will never see a computer perspiring during a chess match, while the human opponent keeps wiping his brow until the handkerchief is drenched. In the case of the Bucharest readers, they, like the computer itself, are protected from psychological tensions, and, therefore, should prove to be strong competition against *any* chess program.

"I think after the first 26 moves of this game, the computer is now doomed, with best plays on both sides. 27. QxP is the best move for the readers but they must play carefully otherwise, with too much haste, ASTRO 64 will manage a draw. For instance: 27 ... PxP; 28. RxR+ ? QxR; 29. QxN Q-e1+; 30. K-g2 Q-f2+; 31. K-h3 Q-h2+; 32. K-g4 p-g2 and White must take the draw by perpetual check by p-g1=Q+ K-f4 Q-g3+ etc. Instead, 27 QxP, PxP 28K-g2 wins." -Morris Miller

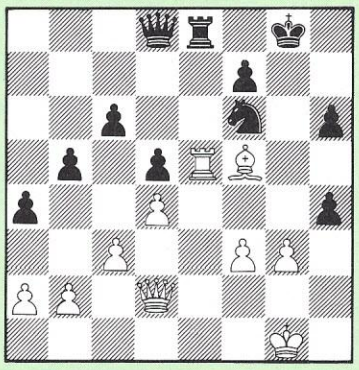
White — **BUCHAREST READERS**

Black — **ASTRO 64 (ON FELIX 256)**

The first 20 moves already shown were:

1.	e2-e4	e7-e5;
2.	Ng1-f3	Nb8-c6;
3.	Bf1-b5	a7-a6;
4.	Bb5-a4	b7-b5;
5.	Ba4-b3	Ng8-f6;
6.	0-0	Nf6xe4;
7.	Rf1-e1	d7-d5;
8.	d2-d3	Ne4-f6;
9.	Nf3xe5	Nc6xe5;
10.	RxN+	B-e6;
11.	B-g5	Bf8-d6;
12.	R-e1	0-0;
13.	N-d2	h7-h6;
14.	B-h4	g7-g5;
15.	B-g3	BxB;
16.	PfxB	B-g4;
17.	N-f3	Q-d7;
18.	Q-d2	BxN;
19.	PxB	Rf-e8;
20.	d3-d4	Rxe1+;

Position after Black's 26th move



The game now continues as follows, with the next six moves:
Black — The Computer
White — The People

21.	RxR	a6-a5
22.	c2-c3	a5-a4
23.	B-c2	R-e8
24.	R-e5	c7-c6
25.	B-f5	Q-d8
26.	h2-h4	PxP

Mike Valenti's computer chess program, Part IX, will appear next month.

Boris Joins A Chess Club

An announcement from the Boylston Chess Club, Boston, arrived from secretary Lewis Schultz: "It is with a feeling of grateful pleasure," wrote Schultz, "that I hereby formally announce to you, and to the manufacturers of the chess-playing computer, BORIS, that:

'BORIS IS HEREBY UNANIMOUSLY DECLARED TO BE A LIFE MEMBER OF THE BOYLSTON CHESS CLUB.'

"Our executive board made BORIS a member on October 6, 1978. To ensure BORIS a long life, every effort will be made to secure the new member from harm."

That announcement, coming from the venerable 100-year-old Boylston Chess Club, marked the historic occurrence of the chess world finally accepting into their membership an integrated circuit designed to do four things: 1) To play chess. 2) To try its darndest to beat the pants off an opponent. 3) To win enthusiastically. 4) To lose gracefully.

At a recent visit to the Boylston Chess Club for a closer look at the organization that had held out a welcoming hand to the computer, we learned that the YMCU (Young Men's Christian Union), which houses the chess club, is more than 100 years old. The chess club, was organized not long after the founding of the Union and the building itself has recently been declared an historic landmark by Boston's Landmark Commission. One of the best examples of High Victorian Gothic design, the building was designed by Nathaniel J. Bradlee in 1875. The five-story structure is built of masonry with a street facade of buff colored sandstone. Although the building conspicuously lacks the polychromy typical of the High Victorian Gothic period, the massing and detailing, especially the ornate main entranceway, clearly define the period.

At the chess hall we met Harry Lyman, former president of the organization, and now one of the elder statesmen of the club.

"Chess," mused Harry, "has always been a popular activity at the Union here. Originally the club was called the Union Chess Club. But in 1919, when we got one of the first charters from the US Chess Federation, we changed our name to Boylston Chess Club."

Harry has a pleasant, warm personality. He smiles all the time; and bubbles over with unwavering dedication to chess. You become his friend the minute he says 'hello.' "One of the most famous chess players in the world, Henry Pillsbury, was a member here," continued Harry. "He learned to play chess in 1878 when he was 16 years old. At 22 he played in a world-famous tournament at Hastings in England and won the title."

Harry Lyman has fond memories of his early experiences at the chess club. "In the 1930's," he sighs, and a sad look creeps into his gentle eyes, "the country was in a pretty bad depression. People had nothing to do. Some walked around and around the streets in circles; the way hungry dogs do when they are looking for food. Well, many of them started coming here and they kept up their sanity by playing a game of chess. I, myself, would walk around like that looking for work. After about an hour or so of useless looking I'd get depressed. So, I'd come here and play chess. It's the most wonderful medicine in the world. It didn't matter whether I won or lost. It made me feel a lot better. Made me forget my troubles for awhile. What about BORIS coming into the club? Well, the feeling is that in about four or five years the microcomputer will be doing what the large computers are now doing. Computers will revolutionize chess. Look what a wonderful thing it will be for bed-ridden people, people who never leave their houses, sailors in submarines, travelers, lonesome people. With a friend like BORIS you *always* have a companion. Someone you can chat with — in the language of chess, of course. But you have a friend who will play chess with you anytime you want and never get bored. and will always brighten your day. I welcome BORIS to the club. I am happy he is here. Confidentially, though, I wouldn't care to play him now. He might beat me, and my friends here would laugh at me. I'll probably wind up getting my own BORIS, take it home and practice with it. Nice thing about BORIS you know — you can play with it quietly with no kibitzers around. Computer chess is revolutionizing the game, no question about it. Making it more popular. Young kids who have never played chess before can come to the chess club here and play the ma-

"Okay. Nobody moves! Diss iz a stick up!"

chine. Once they play good enough to beat BORIS at 3 minutes then they can start playing other members. BORIS is patient. He will give them confidence and make better chess players out of them. I wish I had had one of these myself during the depression. Then I could sit on a bench in Boston Common — where many unemployed people used to sit — and play chess all day.

Beginners at Boylston Chess Club, once they have beaten the computer, will go on to higher levels. Before long they will be involved in stiff human competition. Even in tournaments. I believe these computerized chess games will help mold future world champions. Even kids at home can start playing when they're 3 or 4."

The honor of being the first club member to play an official game with BORIS went to Jim Rizzitano, of Needham, MA. Jim has a rating of master and at 17, is one of the youngest chess masters in New England. He set BORIS to 10 seconds (BORIS' optimum time is 3 minutes) to see how fast it could think, then proceeded to demolish the computer in the following brief encounter:

White — *Rizzitano* Black — *BORIS*
Comments by Jim

1. e2-e4	d7-d5	
2. e4:df	e7-e5?	("BORIS SEEMS TO LIKE OPEN LINES.")
3. Ng1-f3	e5-e4	(BORIS DIDN'T UNDERSTAND TAKING EN PASSANT AT THIS LEVEL")
4. d1-e2	d8:d5	
5. b1-c3	d5-f5	
6. c3:e4	b8-c6	("DIDN'T REALIZE THE DANGER OF A DOUBLE CHECK?")
7. e4-f6+	e8-d8	
8. e2-e8 Mate!		

Position at end of 8-move game.

BORIS comes to a quick end at his debut as a newly-elected life member of Boston's Boylston Chess Club. He was greeted by the Club's official chief, high, executioner, 17-year-old chessmaster Jim Rizzitano.

Current Chess Chatter

. . . In a previous issue we had stated that there was only one computer program on GO to our knowledge. It was at the University of Wisconsin and had been written by Bill Wickert. Well, that information was wrong. First of all, the correct spelling of Bill's name is Wickart. Secondly, he does not now have a computer-GO program. However, he has a lot of interest in GO; is at work on a program and may have something later next year. We have learned, though, that Professor David Benson, of Washington State University, does have a GO program in the computer there. However, his program, at the moment, is broken up into "bits and pieces," he says. It can solve small problems or develop an opening game. Two other people have a GO program, which is capable of playing a complete game in this complex routine of "moving stones around on a chessboard." The two are Walter Reitman and Bruce Wilcox of the University of Michigan. More information on this subject will be upcoming in future reports. Professor Arthur Samuel of Stanford, writes about a program in GO, compiled by Jon Ryder at Stanford under his supervision while Ryder was a graduate student. "The program played only a mediocre game," says Dr. Samuel. "Although nobody was able to do any better for some time. I don't know anything about the Reitman program, and it is possible that Reitman may have easily surpassed Ryder. Jon was a very good GO player (a 3-Dan player when he was here — and probably much better now.) Like all really good GO players, Ryder played somewhat intuitively and he found that transcribing his intuitive knowledge into a computer program was far from easy. Ryder left here to join the Bell Telephone Labs and I believe he is still there."

. . . A note from Prof. M.V. Donskoy, one of KAISSA'S programmers, includes his correct mailing address. It is **INSTITUTE FOR SYSTEMS STUDIES. RYLEYEVA 29. MOSCOW 119034, USSR.** "During the IV International Congress for Cybernetics and General Systems," he writes, "KAISSA played three exhibition games against human opponents. The Congress was held in Amsterdam in August 1978. KAISSA used an IBM 370/158, which was much less powerful than the 168 KAISSA used in Toronto. As a result, it lost two games and won one. Nevertheless, the games were impressive because they showed typical computer errors. Barend Swets was organizer of this exhibition."

. . . Answer to January's chess puzzle (from Alan Gottleib's Puzzle Corner in MIT's Technology Review):

1. N-QB7 ck	K-Q5
2. RxP ck	RxR
3. B-N1 ck	R-K6
4. BxR ck	PxB
5. QxP ck	BxQ
6. PxB mate!	

"Although the above solution is not as pretty as other solutions, it is better by virtue of using the minimum number of moves, all forced," observes Alan. (Incidentally, we set up the problem in our office pet, BORIS, let him play white, gave him 20 minutes per move and he came up with the answer after three false starts. As a reward we let him play a game with himself while we went to lunch.)

. . . Barend Swets is organizing-director of the European Computer Chess Championships to be held in Holland this summer. All computer-chess programs are invited to participate in colorful Holland during the most delightful time of the year for that country. For more information contact Barend Swets at Chopinstraat 65, Venray, Netherlands.

. . . The surprise of the 9th Computer Chess Tournament at ACM's annual conference in Washington, DC was the amazing finish of a microcomputer (SARGON II) in a tie for third place. Exhibition of the growing power of the micro not only amazed the participants, but also it caused them to comment that the micro would be treated with more respect in the 10th Computer Chess Tournament.

. . . At the end of the third round, Blitz 6.5 and Belle, were the two top programs that had emerged to meet each other in the fourth round for the title. Belle won the ensuing match but did not detract from the Blitz 6.5 reputation as one of the stronger programs in the meeting. Bob Hyatt's disappointment in the Blitz performance was due to his inability to get access to a strong machine which had been promised him earlier. The use of a faster machine would have made Blitz 6.5 a much more formidable opponent for Belle.

. . . David Levy, writing in the November issue of Chess Life and Review says: "About three weeks before leaving England for Toronto, I received a most unexpected challenge from Richard Greenblatt of M.I.T. Greenblatt, it will be recalled, was the author of the program MacHack VI, which achieved fame around 1967 by finding a pretty Rook sacrifice that had been overlooked by a number of U.S. masters. Although very little news of chess had been emanating from M.I.T.'s Artificial Intelligence labs during the past decade, scientists there were known to be working on a piece of hardware designed to do nothing but analyze, generate, and evaluate chess positions at the rate of 150,000 per second!! This machine, called CHEOPS, would be used by an improved version of the Greenblatt program in the following way: whenever the main program reached a position it considered strategically satisfactory, CHEOPS would take a look at the further tactical possibilities. This enabled the program to avoid numerous traps."

David Levy won his bet against Professor Greenblatt by knocking off only one of the two scheduled games of the match. The bet stipulated he only had to win 51%. It was an unusual odds situation so we sought the advice of a friend of ours, "Backside Wilson" who was born in a race track tack room and was named after one of the turns in a six-furlong race. He hangs out around the tote board, carefully studying changing odds and gives free advice to friends on such things as "how to lose your shirt like a gentleman." Backside put his racing form in his pocket and studied his fingernails for a minute.

"Professor Greenblatt obviously don't go to race tracks," he finally said. "That's where smart gamblers avoid even money shots or, worse, 1 to 2 shots which was what the professor gave this guy Levy. In other words, the professor was assuming the enormous challenge of winning *100%* of the games played. Nobody should be that confident — not even in a one-horse race where the only horse could drop dead before it reaches the finish line and you lose your bet. If he had opted for 100 games, he would only have had to win *51%* of the games played, not 100%. And by the end of 100 games, David Levy would have been so bushed he would have fallen asleep at the chess board and lost his bet on a time forfeit. That's how horse races are handicapped. Call Levy back! Have another go at him but with more sensible odds — and count me in for a fiver!"

"When a Duchess Reigned in Jerusalem"

By Dr. Alan Biermann

A computer-chess program, DUCHESS, developed at Duke University, conquered all opposition at the Jerusalem Computer-Chess Tournament, last summer, to win the championship there. DUCHESS (standing for Duke University Chess), was paired in three sequential matches against BS'66'76, from the Netherlands; CHESS 4.6, winner of the 1977 Computer Chess World Championship from Northwestern University; and CHAOS from the University of Michigan. The Duke team was especially pleased with the win over Northwestern in view of the close rivalry that had developed between the two teams during the past year. In August 1977, Duke lost to Northwestern in the world championship tournament at Toronto, but tied for second place with the program KAISSA from the Soviet Union. Then in October 1977, Duke tied Northwestern in the North American Computer Chess Championship in Seattle to share the championship. The Jerusalem victory was the first time Duke had defeated the program which has dominated computer chess for the last several years. DUCHESS was developed on the Triangle Universities Computation Center's IBM 370/165 and was written by Mr. Tom Truscott, a graduate student in computer science, Mr. Bruce Wright, a staff member of the Duke Medical Center Cardiovascular Computer Laboratory, and Mr. Eric Jensen, a former Duke undergraduate and currently a programmer for a New Jersey computer firm.

Six teams had been invited to compete in Jerusalem. Besides DUCHESS, CHAOS and CHESS 4.6, the two other programs were a contestant from McGill University in Montreal, and one from Eidgenossische Technsche in Zurich. Large display chess boards were set up in the tournament room and the two competing teams associated with each board had computer terminals nearby which could communicate by phone to the big computers throughout Israel. The borrowed computers were made available by both private firms and government institutions.

The borrowed machines turned out to be a great disadvantage for Northwestern. In previous tournaments at home, CHESS 4.6 had the use of one of

the fastest computers in existence, a CDC Cyber 176. In Israel, the Northwestern team had to use a machine which is comparable in speed to the machine used by Duke. The programs from Northwestern and University of Michigan subsequently finished the tournament in a tie for second place.

Duke's chess efforts began seven years ago when Bruce Wright and Tom Truscott were chemistry partners during their freshman year. Wright was an expert chess player and both had strong interests in computer programming. DUCHESS went through considerable development and several major revisions before it was entered in its first national competition in 1974. It finished in eighth place against a dozen other programs. In the following two years it placed fifth in similar tournaments. The early DUCHESS simulated thought processes of expert players by formulating plans of attack and searching for move sequences to carry out such plans. It typically examined only about one thousand boards before making a move.

During the past two years Truscott and Eric Jensen developed a checker-playing program which used a different design philosophy. This new approach, pioneered originally by the Northwestern chess project, stresses the importance of examining large numbers of boards even though very little time may be spent processing or "thinking about" an individual move. The checker-playing program was so successful that the three programmers, Truscott, Wright and Jensen, decided in May of 1977, to completely rewrite DUCHESS using ideas from both approaches. The resulting crash project of June and July 1977 yielded a greatly improved version of DUCHESS, which now could examine approximately one hundred thousand boards before making a move (20,000 boards on the Israeli IBM 370/158). This program showed its power the following month in Toronto by upsetting world champion KAISSA from the USSR in the first round of play, then going on to tie for second place. In the subsequent November tournament, DUCHESS tied Northwestern for the North American championship. Academic advisors to the project are Drs. Alan W. Biermann and Dietolf Ramm.

Computer chess programs have not yet been developed to the point where they will beat the best human chess players in the world. However, they can defeat most amateur players and they can defeat master players in "speed chess" which requires players to hurry through the game at a rate of several moves per minute. DUCHESS and CHESS 4.6 have both played International Chess Master David Levy and defeated him in "speed chess."

(There are some current philosophical arguments which contend that the highest level a computer will ever reach will be a point where it is unbeatable and achieving consistent draws against grandmasters. Probably the computer will even beat the grandmaster as the human buckles under his own inner emotions and tensions — weaknesses lacking in the computer. The reason for this assumption is that when a grandmaster reaches the topmost level in chess it is an indication that he plays chess as perfectly as it can possibly be played. The computer then cannot hope to improve on that achievement. Similarly, if a human can complete a complicated crossword puzzle in two hours, the computer may be able to do it in 15 minutes. But it won't be able to do it any *better*. That, then, is the chief difference between a champion computer-chess program and a grandmaster. They will both play equally well but the computer will do it much faster. Result: a draw. — Ed.)

White — **DUCHESS**
Black — **CHESS 4.7**

1. P-K4	N-QB3 (a)	32. R-B6	N-B5+
2. P-Q4	P-Q4	33. K-B1	N-Q6
3. P-K5 (b)	P-B3	34. B-Q2 ? (k)	BxP
4. N-KB3 ?	B-B4	35. RxRP	P-R4
5. B-QN5 ?	Q-Q2	36. K-K2 ? (l)	N-B5+
6. O-O	P-QR3	37. K-K3 ?	N-R6
7. B-Q3	B-N5	38. K-Q4 ??	NxP
8. PxP	NXP (B3)	39. R-R8+	K-B2
9. P-B3	P-K4 ?	40. KxP	N-N5
10. NxP (c)	BxQ	41. B-N5	K-N3
11. NxQ	NxN (d)	42. B-K7	B-N6
12. RxB	B-K2	43. R-KB8	P-R5
13. B-B5	R-Q1	44. K-B6?	P-R6
14. B-K6	N-B1	45. R-KB1	N-K6
15. B-N4	N-N3	46. R-KR1	P-R7
16. R-K1	O-O	47. B-Q8?	N-B7
17. P-QN3 ? (e)	P-QN4	48. BxP	N-Q5+
18. P-QR4	P-N5	49. K-N7	BxB
19. R-K6	N-R4	50. KxB	NxP
20. B-Q1	R-Q3	51. RxP	K-B4
21. RxR	BxR	52. K-Q6	P-N4
22. PxP	N-B3	53. K-Q5	P-N5
23. B-B3	RxB (f)	54. K-B4	P-N6
24. PxR	NxQP	55. R-R2	K-K5
25. N-Q2	N-R5 (g)	56. KxN	K-Q4
26. B-N2	N(Q)xP+	57. R-KN2	K-K4
27. NxN	NxN+	58. RxP	K-Q4
28. K-N2	N-Q7 (h)	59. P-R5	Resigns
29. B-B3	N-K5		
30. B-K1	N-B3 (j)		
31. R-B1	N-R4		

Position after Black's 23rd move

(Morris Miller calls it a spectacular "Force Majeure.")

Jerusalem Annotations

by Morris Miller

(a) An opening idea of Niemzowitsch.

(b) 3. N-QB3, PxP; 4. P-Q5 is quite a good play. DUCHESS wants to play a French Defense with the cramping move P-K5 where CHESS cannot make the liberating move of P-QB4 without laborious preparation.

(c) This wins a Pawn but complicates the game. Instead and preferable, is 10. PxP, NxP?; 11. NxN wins a piece. There are several other variations at this 10th move, all of them better choices than the NxP.

(d) CHESS prefers to yield the two Bishops to an isolated KB Pawn, — a wrong choice.

(e) Now DUCHESS flounders. Having an extra Pawn on the King side (Niemzowitsch's "candidate") a forward push on the King side is indicated by 17. P-KN3 followed by P-KB4, N-Q2, N-KB3, B-Q2 and finally N-K5. 17. P-KN3 would also prevent infiltration of the black Knight at B5 and Q6. Now, CHESS should play, on the 17th move, . . . N-B5.

(f) CHESS tries "force majeure." It should not work but leads to interesting play.

(g) If 25 . . . BxP; 26. B-N2. CHESS is just one move too short.

(h) Both machines see if 28 . . . NxP? 29. P-B3 trapping the Knight. DUCHESS could end the game quickly now by 29. P-N5, PxP; 30. P-R5, B-B4; 31. P-R6, B-R2; 32. R-QB etc.

(j) While this move could be forced, DUCHESS should start moving up the King side Pawns. (R-Q forces N-B3 for if N-B3, fine, but P-B3?, R-QB. Hence best seems 30 . . . K-B2 to protect the QP by K-K3 if necessary.)

(k) RxRP wins: 34 . . . . NxNP?; 35. RxB, PxR; 36. BxN

(l) Duchess still has an easy win by 36. K-N2, B-Q3; 37. RxB PxR; 38. P-R5 N-K4; 39. P-N5, N-Q2; 40. B-K3 wins.

Conclusion: A poor game in which neither machine shone. The only flash of imagination was CHESS's 23rd move (RxB), a sacrifice more spectacular than sound.

Computer Checkers

. . . For many years, the Boston Children's Museum had a PDP-8 computer in its lobby with a checker program on display. Visitors to the museum (mostly children) were invited to try their checker skill against the program. The attraction proved to be a very popular activity and there was usually a line of children pushing and joshing each other while they waited impatiently to have a crack at the checker program. Not many of them were able to beat the computer, however, and no records were kept. The museum's computer, a Digital Equipment Company PDP-8 was abandoned in 1974 in favor of a bigger PDP-1140. The Children's Museum is currently moving into larger quarters and the once popular checker program will again be revived. The program used on the computer was from the DECUS Library (of Digital Equipment Corporation in Marlborough, MA 01752). If any readers have access to a PDP-8 and can get the DECUS checker program, we would appreciate hearing from them.

. . . TCD Incorporated, PO Box 58742, Houston, Texas 77058, is currently selling a program that plays a strong game of checkers, according to the distributors. The program, when input to the computer, can be set to play at two different levels of difficulty (four and six-move look ahead) for both the beginner and the advanced player. At level four the program will respond in less than four seconds and at level six the program's response is between one and two minutes. An interesting feature, says TDC, is that it randomly selects between two equal moves. Some players that have beaten it once, cannot duplicate their feat. The checker board is imaged on the video display using the full height of the screen and three-quarters of the width, thus allowing play without a separate checker board. Hardware required is an 8080/Z80 computer with 12K RAM and a memory-mapping display (such as the SOL, VDM-1 or the TRS-80.) The software is distributed on CUTS cassette tape (orged at 0) and on North Star diskette (orged at 2A00H). Prices are $19.50 and $24.50 respectively with generous discounts available to dealers. Documentation includes all the necessary patches to allow "8080 Checkers" to run on most systems.

. . .Checker players around the country are so strongly convinced that their champion, Dr. Marion Tinsely, will beat any computer program, that there is talk of raising the ante. Some reports say that many of his friends are willing to put up their own money to increase the stake match to $15,000 or $20,000! So far, computer programmers have been timid about taking up the challenge.

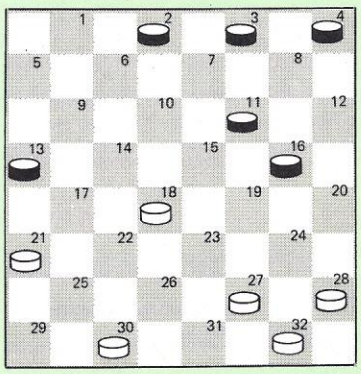
. . . In 1963, Robert Nealey, blind checker champion of Stamford, Connecticut, challenged Dr. Samuel's checker program, written in 1959, then being run on an IBM 7094 by means of punch cards. The challenge was accepted and the resulting match ran for six months. Nealey played from his home in Connecticut and transmitted the moves by mail. Dick Fortman, analyzes one of the games, here. In an accompanying note, Dick writes: "Nealey is legally blind, but has been playing expert checkers for many years in a number of major tournaments. He uses a special grooved checkerboard and the pieces are either square or round (representing White or Black.) Nealey is permitted to touch the pieces

(an action usually prohibited by official chess or checker rules) so that he can recognize changing board positions. Can anyone think of a more wonderful hobby (other than Braille) than either checkers or chess for a blind person? They come to the game table with no disadvantage because of their handicap. Actually, blind people usually are better players, because they have a fixed, sharp, constant image of the checkerboard position in their minds."

Black-*IBM 7094* White-*ROBERT NEALEY*
Date-September 1963
(Black Moves First)

1.	10-15	22-17
2.	15-19 (a)	24-15 (b)
3.	11-18	23-14
4.	9-18	26-23 (c)
5.	6-9	23-14
6.	9-18	31-26 (d)
7.	5-9	26-23
8.	9-14	17-10
9.	7-14	25-22 (e)
10.	18-25	29-22
11.	8-11	22-18
12.	1-6 (f)	18-9
13.	6-13	23-18
14.	12-16 (g)	18-14 (h)
15.	13-17	14-9
16.	17-22	28-24
17.	11-15	9-5
18.	16-19	24-20 (i)
19.	19-24	27-23
20.	22-25 (j)	23-19
21.	15-18	21-17
22.	25-29	17-13
23.	4-8 (k)	5-1
24.	18-23	13-9
25.	24-27	1-5
26.	27-31	9-6
27.	2-9	5-14
28.	31-27 (l)	19-15
29.	27-31	15-10
30.	8-11	10-6
31.	11-15	14-10
32.	15-18	10-15
33.	18-22	15-19
34.	22-26 (m)	19-24

Position after Black's 14th move



("The computer stumbles at this point," says Dick Fortman)

(Notes to game: IBM 7094 computer vs. Robt. Nealey.)
by R.L. Fortman

A) Under the 'three-move' forced restriction, the opening played here is one of the more critical of the 142 approved ballots, resulting in an exposed piece on Sq. 18. Due to the many years of analysis in proving a sound Black draw, it is known as the "Skull-Cracker" — an apt sobriquet indeed.

B) The correct route to maintain the advantage, as 23-16 permits 11-20, and virtually an even position.

C) This is the direct attack against the piece. 17-13 is also powerful, with the threat of 26-23 next, but may be countered with 5-9, 21-17, 8-11, 25-21, then the starred 9-14 exchange has proven sufficient to draw.

D) 30-26 is also favored, then 5-9, 17-14, 9-13, 26-23, 1-5, 28-24, 8-11, and both 24-20, (or 24-19) lead to vicious attacks, but no forced wins have been discovered.

E) With the piece on 18 now adequately protected, White shifts tactics with this exchange, to further damage the exposed Black double corner side. . .

F) All of Black's previous moves have been forced to this point. Mr. Samuel's program is to be complimented on the choice used here, as the more natural 1-5 loses after 18-9, 5-14, then 23-18, 14-23, 27-28, etc.

G) But here the computer stumbles. With the piece on square 13 (in contrast to Note F) this temporary sacrifice will draw. 11-15, 18-11, and 3-8 can be made, then 27-23, (or 11-7, 2-11, 28-24, 11-15, 24-20, 15-18 drs.) 8-15, 28-24. With just 5 pieces remaining, Black must still exercise extreme caution. Cont: 4-8, 30-26, 12-16, 26-22, 8-11, 21-17, 16-20, 23-18, 20-27, 32-23, then 2-7, 17-14, and 15-19 escapes to draw. (Analysis by Walter Hellman, late world champion, of Gary, IN.)

H) White now proceeds to crown a 'free' king, whereas Black must go to the crownhead under a 'bridge', consisting of the White pieces on squares 30 and 32, which results in a later attack against the Black piece on sq. 23.

I) Not 32-28, as 4-8, 5-1, continuation allows Black to draw. (Text maintains the bridge ending.)

J) Black cannot crown either 22-26, in view of 23-19 — or 24-27, after 23-18; losing a piece and the game, and one aspect of the Black weakness mentioned in Note H.

K) This serves no useful purpose, and allows White an extra move on the later 9-6 exchange. Black should go directly in with 18-23, 5-1, 24-27; preparing to crown 27-31 at the next move, then sacrifice 23-26, 30-23, and 31-27. . . However, after 24-27, White may win with 19-16, to avoid this idea and win.

L) The White king now protects the intended 23-26 sacrifice, and the win is now a matter of technique.

M) Ties up the Black pieces, with immediate resignation. Instead, 22-25, 30-21, 29-25, 19-26, 31-22 gives Black more resistance, but White should still win with care and with the piece advantage. . .

MICRO GRAPHICS and X-Y PLOTTER

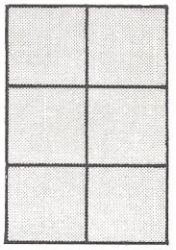
by Kathe Spracklen

"First of all, the whole basis of graphics is simply the dot."

At present, microcomputers with graphics capability suffer from a lack of documentation. This article outlines the basic techniques of graphics generation at the beginning-assembler-programmer-level. Also explained are control mechanisms needed to properly manipulate the plotter. The charts shown here will be of value to any programmer who wants to display specific shapes or pictures; such as, representing a chess board, or animating characters. Possible arrangements of graphics characters on the screen are explained as well as the use of pillar and bar formatting. For entertainment video graphics can add sparkle and punch to games. In business applications, graphs and charts can dramatically sum up sales performances. Besides, graphics programming can be just plain fun if and when you add a plotter to your microcomputer.

Basic principles of graphics control are easily mastered once some elementary points are made clear. First of all, the whole basis of graphics is simply the dot:

Size of the dot varies with the resolution of the graphics. Ten to 12 dots per inch is quite common. Dots, however, don't come singly. Most micro-graphics groups contain six dots, called a block. The blocks are controlled by a single byte.



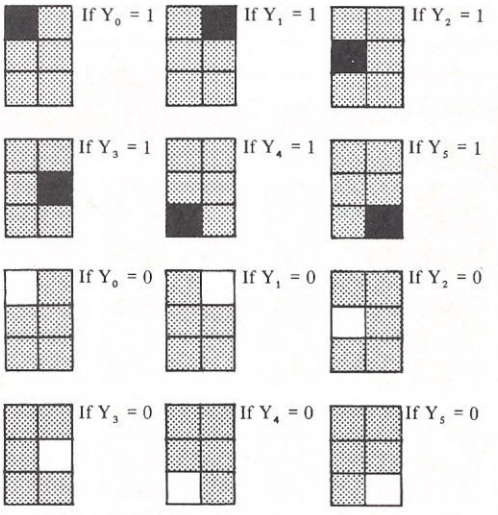
This allows finer resolution than would be possible if a whole byte controlled just one dot. However, this method creates a few problems in isolating and manipulating a single dot. It is this job of individual dot-control which the X-Y plotter tackles. The user can employ the (x,y) coordinates of the dot in the graphics matrix and totally ignore the block problem.

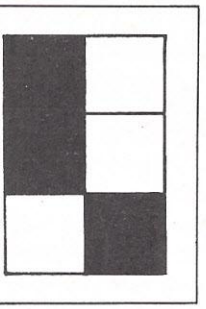
Graphics Control

Every graphics byte is of the form

$1XY_5Y_4\ Y_3Y_2Y_1Y_0$

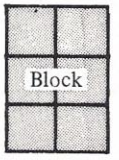
1 - Indicates a graphics character
X - Is unimportant, may be 0 or 1 with no effect on the resultant graphics character.





By varying and combining bits, a total of 64 different graphics characters can be produced. For example, the byte 1010 0101 produces the following arrangement:

Now 1010 0101 = 165 in decimal which can be used as the ASCII code for this character. For ease in creating graphics pictures, a set of charts, in four groups, will be found at end of article. It provides a key to all 64 possible combinations. Format of the chart entries is:



Binary
Hexadecimal
Decimal (ASCII Code)

So the above example would appear in the chart as:

1010 0101
A5
165

Of course the "X" bit could have been set as follows:

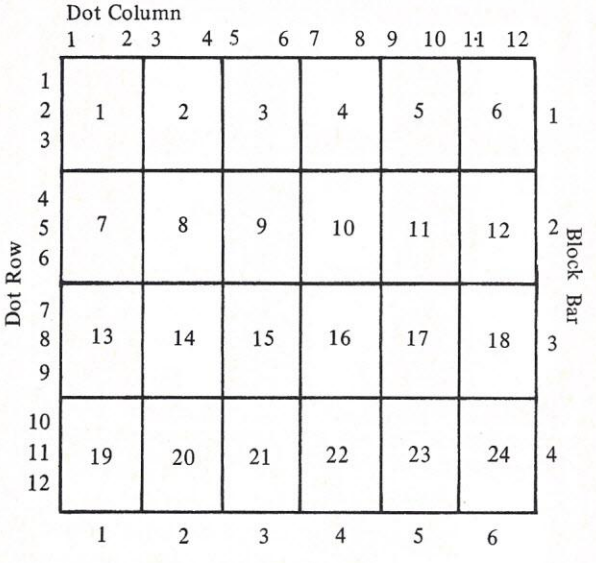
1110 0101
E5
229

The format would then have described the pattern equally well. But it is wise to be consistent in the treatment of this bit and the chart arbitrarily uses X = 0.

(Note: If you are set up for "white on black" video display, all of the squares will be reversed in color from the chart picture.)

Pillar and Bar Formating

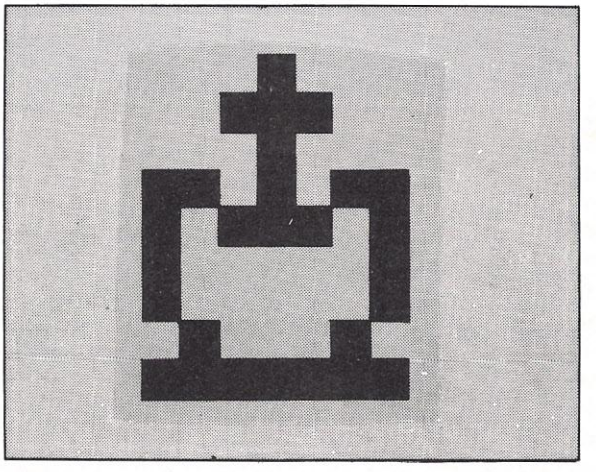
As shown above, individual dots are grouped into blocks of six dots each. The blocks are then laid out like tiles to cover the display area. A dot matrix, that is 12 x 12, would look like this:



Using the terms pillar and bar, when referring to whole blocks, avoids confusion with Dot rows and columns. Thus, a 12 x 12 dot matrix is represented by a 6 x 4 block matrix which will be controlled by 24 consecutive Bytes in main memory. By combining various blocks, pictures can be produced such as this chess piece; a white King on a white square.

80	80	B8	90	80	80
80	9C	BA	98	94	80
80	A5	80	A0	85	80
80	83	83	83	81	80

(By referring to the set of charts, the hexadecimal notation, shown above, will produce the pattern shown below.)



(Graphic representation of white King on white square of a chessboard.)

Animation and Picture Display

Animation and display of specific scenes are complex routines and consume memory rapidly. They won't be discussed extensively here. For instance, a routine to display an empty chess board and insert pieces on their squares for the start of a game takes 132 Bytes of storage, 274 Bytes of Z-80 assembly language code and utilizes 96 x 96 of a 128 x 96 video dot matrix. This, plus code to handle I/O, display a move on the board, enable the user to set up his choice of position for analysis, and keep a listing of the game in the remaining display area take a total of 2,148 Bytes of storage of which 1,549 Bytes are Z-80 assembly language code.

But if this prospect doesn't frighten you then the chart of graphics and a few move instructions are all you'll need to create chess pieces that move, roses that grow and snoopys that dance on the video screen.

Charts and Games Display

The graphics required for most charts and video game displays are simpler than animation. Neatly labeled bar-charts, fast moving star-wars games and mazes can be produced by a simple X-Y graphics plot-

ter subroutine. This subroutine can be interfaced with other programs written in assembly language or BASIC. It can be taken as a "Black Box" to be copied almost verbatim on any machine using TDL Z-80 Assembly Language, or because it is deeply documented, it can serve as an example in teaching graphics programming.

X-Y Graphics Plotter

The first problem in Dot plotting is the requirement that graphics characters are stored in blocks. The smallest unit of data we can use is the Byte. So the computer cannot be told directly to fetch dot "X" at location (8,6) in the 12 x 12 matrix:

	1	2	3	4	5	6
1						
2						
3	1	2	3	4	5	6
4						
5						
6	7	8	9	10	11	12
7						
8	13	14	X 15	16	17	18
	19	20	21	22	23	24

Instead, one must request Byte 15 as the one involving "X". Then he must ask about bit 3 in Byte 15.

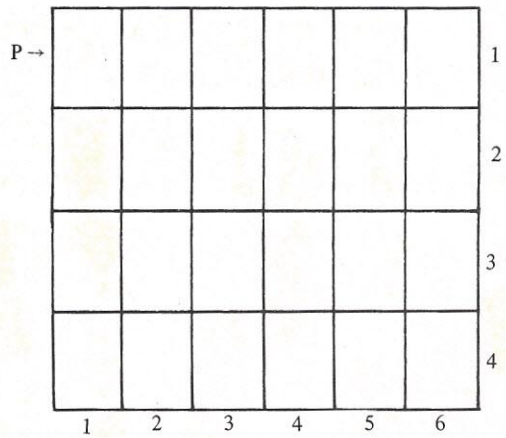
0	1
2	3
4	5

15

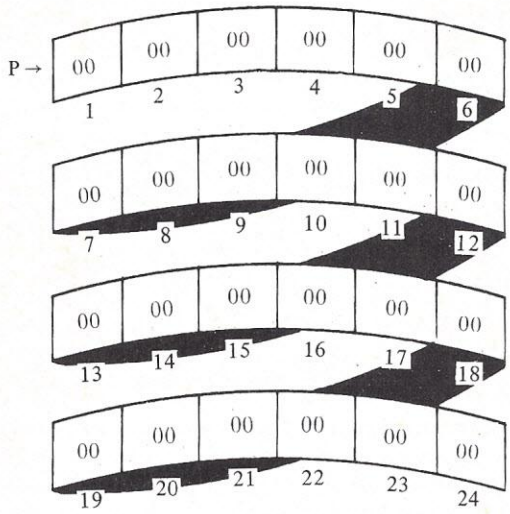
A chart, graph or games user would prefer to consider his entire 12x12 matrix as a simple (x,y) cartesian plane. This is the function of the X-Y plotter. But the X-Y plotter has a third parameter (besides passing the X and Y coordinates which locate the dot) – the action parameter identifies what is to be done with the dot. Choices are "darken", "lighten", "complement" and "inspect".

Explaining the X-Y Process

1. Begin with a pointer to the start of a table which we are visualizing as a 6 x 4 block matrix



This matrix is, in reality, 24 consecutive Bytes in main memory.



2. Now move the pointer to "visit" each Byte.

Byte 1 – P + 0 (pointer should not move)
Byte 2 – P + 1 (pointer should move 1)
Byte 3 – P + 2
Byte 4 – P + 3
.
.
.
Byte 15 – P + 14
.
.
.
Byte 24 – P + 23

Bytes should be counted beginning with zero. Blocks should be counted from zero also. Dot, also, should begin with zero because dots are controlled by bits, and bits are numbered beginning with zero. So the matrix should really by thought of as:

P	0	1	2	3	4	5	6	7	8	9	10	11	
0													
1	P+0		P+1		P+2		P+3		P+4		P+5		0
2													
3													
4	P+6		P+7		P+8		P+9		P+10		P+11		1
5													
6													
7	P+12		P+13		P+14		P+15		P+16		P+17		2
8													
9													
10	P+18		P+19		P+20		P+21		P+22		P+23		3
11													
	0		1		2		3		4		5		

Byte 15 can now be found at P + 14. Also if the same dot is desired, its coordinates would now be (7,5). Such a representation is used in this article.

3. Now, describe the address, P + ?, of the Byte involved for any (X,Y) pair of dot coordinates . . .

It's easy if the desired dot is (0,0):

P	0
0	p+0

Because P needn't move

	P 0	1
0	p + 0	

Nor for 01

	P 0	1	2	3
0		P+1		

It must move 1 Byte for (0,2) or (0,3)

Thus, if given an input, (row, col), the col value divided by two is the desired number of Bytes displacement of P. In fact ignoring any fractional part in the result, it's the pillar number.

Going the other way:

P 0
0 P+0

P 0
0
1 P+0

P 0
0
1 P+0
2

P 0	
0	
1 P+0	0
2	
3 P+6	1

Bar number can be determined by dividing by 3 and ignoring any remainder. But as the bar number goes from 0 to 1, the pointer goes from P + 0 to P + 6. A glance at the chart shows, also, that the bar number goes from 1 to 2, the pointer goes from P + 6 to P + 12, and 2 to 3 gives P + 12 to P + 18. So the difference is always 6.

Therefore, for any row number (n,0) first divide by 3 to get the bar number and then multiply the bar number by 6 to get the desired displacement of the pointer.

	0			
0			0/3 = 0 r0	
1	P+0	0	1/3 = 0 r1	0 x 6 = 0
2			2/3 = 0 r2	
3			3/3 = 1 r0	
4	p+6	1	4/3 = 1 r1	1 x 6 = 6
5			5/3 = 1 r2	
6			6/3 = 2 r0	
7	P+12	2	7/3 = 2 r1	2 x 6 = 12
8			8/3 = 2 r2	
9			9/3 = 3 r0	
10	P+18	3	10/3 = 3 r1	3 x 6 = 18
11			11/3 = 3 r2	

For a column number (0, m) first divide by two to get the pillar number and then the pillar number already is the desired displacement.

	0	1	2	3	4	5	6	7	8	9	10	11
0	P+0		P+1		P+2		P+3		P+4		P+5	
	0		1		2		3		4		5	
	0/2 = 0 r0	1/2 = 0 r1	2/2 = 1 r0	3/2 = 1 r1	4/2 = 2 r0	5/2 = 2 r1	6/2 = 3 r0	7/2 = 3 r1	8/2 = 4 r0	9/2 = 4 r1	10/2 = 5 r0	11/2 = 5 r1
	0		1		2		3		4		5	

Now for any row and column (n,m), combine both processes and add the resultant displacements. For example, locate P + ? for dot (7,5)

It is seen from the chart that P + 14 is the desired address.

	0	1	2	3	4	5
0						
1						
2	0	1	2	3	4	5
3						
4						
5	6	7	8	9	10	11
6						
7			X			
	12	13	14			

Calculations:
Row ÷ 3 x 6 = 7/3 x 6 = 12 (Remainder was discarded)
Col ÷ 2 x 1 = 5/2 x 1 = 2
Row Displ + Col Displ = 14

The address problem is thus solved for any (x,y) pair of dot coordinates on a 12 x 12 dot matrix. If the matrix under consideration were 12 x 24, the row multiplier would be 12 instead of 6. In general, the number of blocks "across" the matrix will be the row multiplier. Every time the pointer "drops down one bar" it must skip over a whole row of bytes in memory.

P+0					P+6
Bar 0					Bar 1

4. When the desired block has been fetched from memory into one of the registers, the next step determines which bit in that Byte will control the dot.

0	1
2	3
4	5

In the preceding example, it's easy to see that bit 3 is required, but how could this information come from the original request for dot (7,5)?

The answer can be found in the remainders which were so hastily discarded:

Row Remainders:

	Bit
r0	0 or 1
r1	Bit 2 or 3
r2	Bit 4 or 5

Column Remainders:

r0	r1
Bit 0 or 2 or 4	Bit 1 or 3 or 5

So in analyzing (7,5):

7/3 = 2 r 1 → Bit 2 or Bit 3
5/2 = 2 r 1 → Bit 1 or Bit 3 or Bit 5

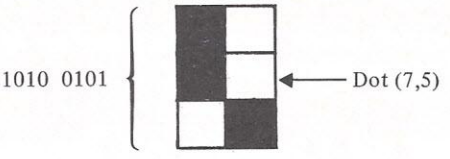
Bit 3, the only Bit which satisfies both, must be the desired bit.

5. The X-Y plotter now performs the desired action ("darken", "lighten", "complement", or "inspect"). This must be done without disturbing other dots in the same block which are controlled by other bits in the same Byte. This is accomplished using a mask such as:

0000 1000

A one Byte mask with a 1 in the bit position involving the desired dot. In this mask for dot (7,5) the only 1 in the mask is in bit position 3. With the aid of the mask, the desired action can now be performed.

Suppose the Byte at P + 14 contained the following bit pattern:



Since Bit 3 = 0, Dot (7,5) is currently white.

Byte P + 14 - 1010 0101
Mask for Bit 3 - 0000 1000

Now the actions can be considered one-by-one.

a. "Darken" - This requires that the target bit be set to 1. The operation of the logical "or" between mask and Byte will insure that a 1 will be in place in the result. But, as importantly, it will not alter any of the remaining bits.

e.g. 1010 0101 - Byte P + 14
V 0000 1000 - Mask for Bit 3
1010 1101

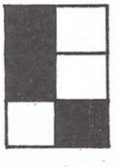
1010 1101 =

And the action has the desired result.

b. "Lighten" - Here the target bit must be reset to zero. For this action the mask must first be complemented and then a logical "and" performed between complemented mask and Byte.

e.g. 1010 0101 - Byte P + 14
Λ 1111 0111 - Complemented Mask
1010 0101 for Bit 3

1010 0101 =



But this action produced no change, because dot (7,5) was originally light.

c. "Complement" - For this action the target bit must be reversed. An "exclusive or" is performed between Byte and Mask.

e.g. 1010 0101 - Byte P + 14
⊕ 0000 1000 - Mask for Bit 3
1010 1101

1010 1101 =

Thus dot (7,5) is reversed from light to dark.

d. "Inspect" - This may not seem to be an action, because the dot is left untouched. But it is examined and its color is reported. A logical "and" between Byte and mask will produce a zero result if the target bit was not set, and a non-zero result if it was.

e.g. 1010 0101
Λ 0000 1000
0000 0000

which indicates the bit was not set.

(These examples are not exhaustive. Some good ones to experiment with are the solid light and solid dark blocks.)

The algorithm for creating the mask, which determines the target bit, is shown below.

Consider the following table of target bits:

Column Remainder

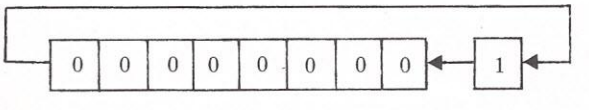
Row Remainder	0	1
0	0	1
1	2	3
2	4	5

The formula emerges:

Row Remainder x 2 + Column Remainder = Bit Number

Because multiplication by 2 can be done with a simple left shift, this seems easy. However the requirement is to create a mask with zeroes everywhere except the target bit.

Here is the method:



a. Put Bit-Number + 1 in Reg. B
b. Set the carry
c. Clear Reg. A
d. Now go into a loop rotating the 1 bit into the de-

sired position by repeating until the B register goes to zero.

6. Although the plotter design is basically complete, the program design has another major task to tackle: error handling and exception checking.

   What if a request comes in to "complement the dot at (-7, 15)"? Blind execution of the program with this data is almost guaranteed to "clobber" some valuable piece of code or data.

   So the plotter includes code to validate the row and column inputs. It will replace negative values with the smallest possible value, 0, and values over maximum will be replaced with the maximum, 11 in the 12 x 12 example. Thus an input of (-7,15) would be converted to dot (0, 11) before processing.

There is the likelihood of invalid action codes if some kind of 1-4 numbering were assigned to the four possibilities. This can be circumvented by a continuous numbering scheme such as the one used in the actual plotter code:

Action

Inspect - -1 or less
Lighten - 0
Darken - 1
Complement - 2 or greater

And, another problem:
suppose the 24 Bytes in memory, which are assumed to contain graphics characters, in reality contain text in ASCII?

	T	H	I	S	
20	54	48	49	53	20
		I	S		
20	20	49	53	20	20
D	R	A	G	O	N
44	52	41	47	4F	4E
	M	A	Z	E	
20	4D	41	5A	45	20

A request now comes into the plotter with:

Row: 7
Col: 5
Action: 2
("Complement")

"A" = 0100 0001
Mask = ⊕ 0000 1000

"I" = 0100 1001

So the plotter, used directly on this matrix, would change "dragon" to "drigon". That is hardly the desired effect.

In the version of code which follows, the X-Y plotter, when asked to lighten, darken, or complement, will first turn a non-graphics block to a graphics blank (80 Hex) and then perform the requested action.

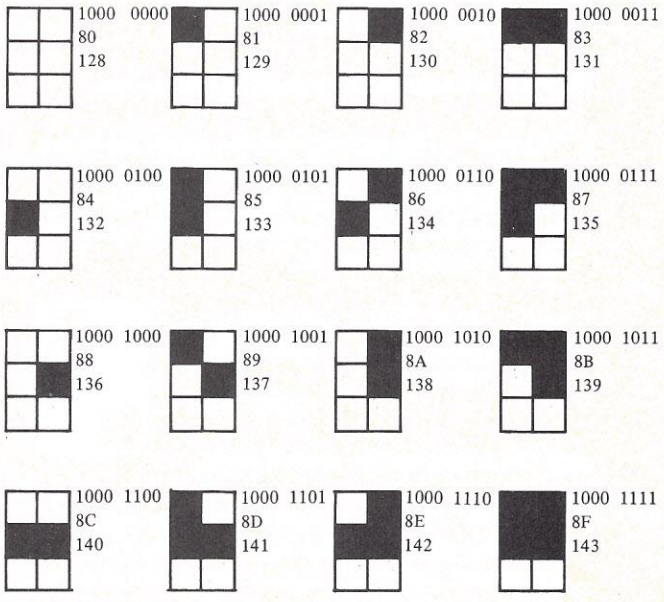
Finally, the result of the "inspect" action can be considered. An action code -1 or less will produce an "inspect." The response to the request is a code value which describes the dot named. Possible values are:
0 - Dot is light
1 - Dot is dark
2 - Dot is not a graphics character

Resultant codes are returned in the action variable.

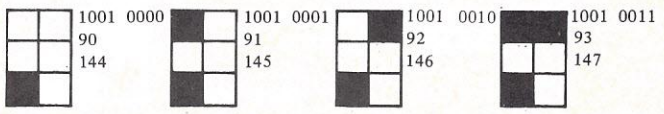
(Next month's article describes the actual use of the X-Y plotter in "Micrographics")

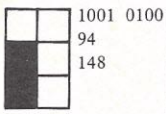
Chart of Graphics Characters

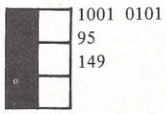
Group 1

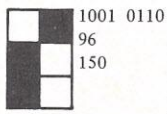


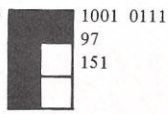
Group 2

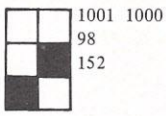


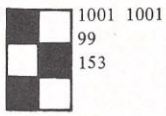

1001 0100
94
148

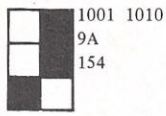

1001 0101
95
149

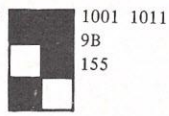

1001 0110
96
150

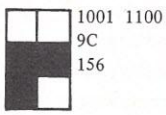

1001 0111
97
151

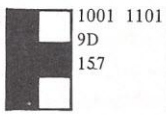

1001 1000
98
152

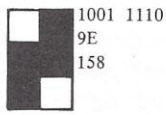

1001 1001
99
153

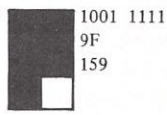

1001 1010
9A
154


1001 1011
9B
155

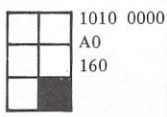

1001 1100
9C
156

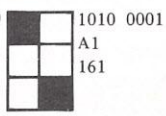

1001 1101
9D
157

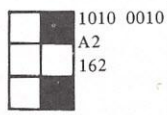

1001 1110
9E
158

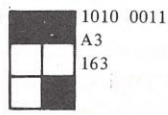

1001 1111
9F
159

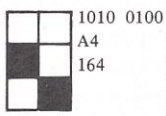
Group 3


1010 0000
A0
160


1010 0001
A1
161


1010 0010
A2
162


1010 0011
A3
163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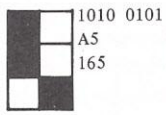
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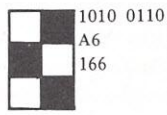
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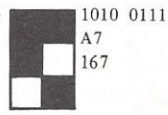
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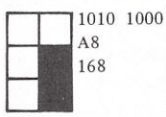
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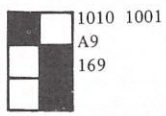
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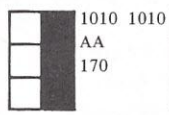
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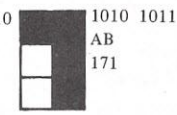
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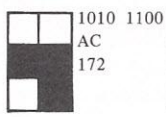
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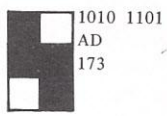
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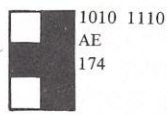
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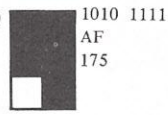
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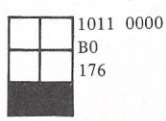
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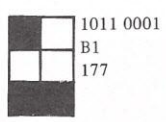
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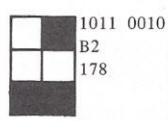
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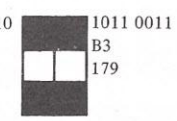
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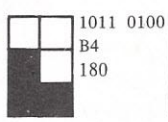
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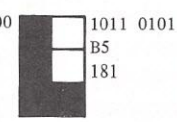
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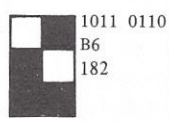
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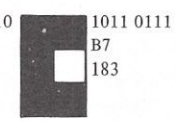
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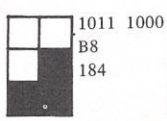
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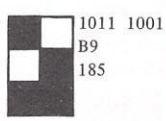
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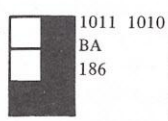
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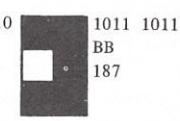
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WHAT'S COMING UP

SYSTEMS

Heath Announces Assembled Computers

Most major Heath computer products are now available in assembled as well as kit form.

Assembled products include the WH8 8-Bit Computer and its associated memory and interface boards, the WH17 Floppy Disk System for the WH8, the WH11A 16-Bit Computer and associated memory and interface boards, the WH27 Floppy Disk System for the WH11A, and the WH14 Line Printer designed for use with either computer system. For more information, send for a free copy of the latest Heathkit catalog. Write Heath Company, Dept. 350-830, Benton Harbor, MI 49022. *Circle No. 173*

Detachable Keyboard Version of 3600 Video Display Workstation

A version of the 3600 video display workstation with a detachable keyboard option is available from Datapoint Corp. The keyboard may be extended one meter away from the display unit for the convenience of the operator.

Used in Datapoint's DATASHARE business timesharing system, the 3600 allows users to access the data processing and data storage capability of the system. The 3600 may be used with an optional terminal printer and includes a standard software switch that allows application programmers to command the terminal printer to be turned on or off under application program control without operator intervention.

The 3600 incorporates a new styling but retains the glare-free screen to eliminate reflections and operator fatigue.

The 3600 may be ordered with or without the detachable keyboard, but the option must be ordered from the factory and is not field upgradable. The 3600 sells for $1950 with the keyboard option at $250. The 3600 may also be leased for $77 per month or with the removable keyboard option for $86 per month. Maintenance for either model is $20. For more information contact Datapoint Corp., 9725 Datapoint Dr., San Antonio, TX 78284; (512) 699-7000. *Circle No. 174*

Office Information System from Wang

The Office Information System OIS/140 from Wang combines word processing functions with information processing capabilities. OIS/140 can accommodate up to 32 devices such as workstations, printers, photocompositors, telecommunications and optical character recognition (OCR) equipment, said the company. It is available in three models, each with successively larger storage capacities up to a maximum or 80.4 megabytes.

According to Frederick A. Wang, director of Wang's Office Systems Marketing group, the OIS/140 meets the needs of organizations with growing word processing and information handling requirements. "Our family of word processing systems, and now our office information systems, can accommodate word processing needs from standalone secretarial units to multi-workstation systems that communicate to computers or word processors throughout the world. The three models of the OIS/140, for example, allow customers to purchase only the amount of disk storage they presently need. Disk size can be increased as users' information processing needs grow."

The system's three models are totally compatible with one another and easily upgraded. The Model I has a 26.8 megabyte disk to store approximately 10,700 pages of text; the Model II has a 53.6 MB disk to store 21,400 pages; and the Model III has a 80.4 MB disk to store 32,100 pages.

Standard math and sort features allow the OIS/140 to perform sophisticated information processing functions, while the system's password security and disk erase feature insures confidentiality of information. A disk equal in size to the master disk can be attached if there is a need to back-up the system each night. This feature can also be used for archiving with 13 megabytes of removable media. An optional 5 megabyte disk can be added to the system if only archiving is desired.

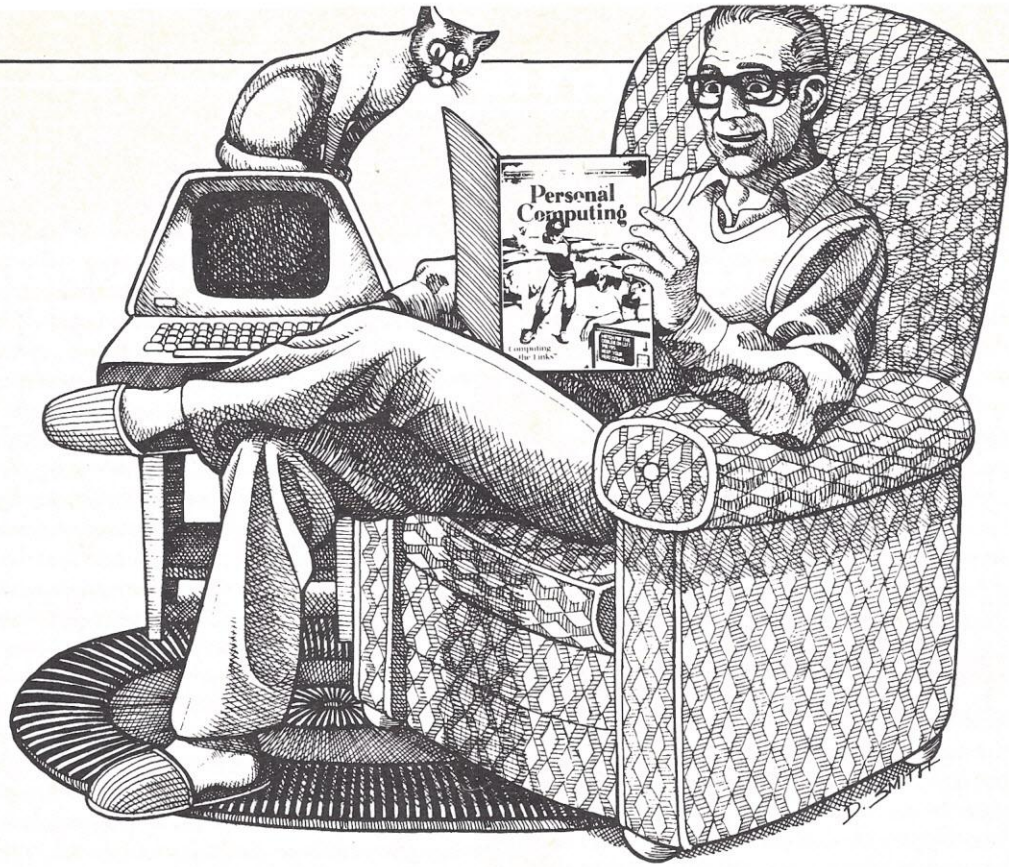
Purchase price of the system includes the master disk, central processing unit (CPU) and single diskette. Model I is $26,000; Model II, $28,000; and Model III, $30,000. Each workstation is priced at $5000 and a variety of printers and other devices is available at additional cost. For more information contact Wang Laboratories, Inc., One Industrial Ave., Lowell, MA 01851; (617) 851-4111. *Circle No. 175*

6800 Development Package

A 16K development system for the 6800 can be configured for $895, according to Wintek Corp. The package includes a burned-in single board computer, 16K RAM, RS-232 interface with switch selectable baud rates, 300 and 2400 baud cassette interfaces, Fantom-11 monitor/debug ROM, editory/assembler software, card rack, back plane and power supply. An EROM programmer module and 15 interface modules are also available on 4½" x 6½" boards with industry standard 22/44 pin edge connectors. Contact Wintek Corp., 902 N. 9th St., Lafayette, IN 47904; (317) 742-6802. *Circle No. 176*

Intel 8086 Interfaced to S-100 Bus

The new Intel 8086 sixteen bit microprocessor has been interfaced to the S-100 bus meeting the IEEE Proposed Standard for the S-100 Bus (operating at 4 MHz). Tecmar's



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8086/S-100 System consists of a CPU card with vectored interrupts, an EPROM-I/O interface and a RAM card. The 8086 is designed to provide ten times the computer capabilities of the 8080 with software that is upward compatible at the assembly language level. It supports one megabyte of memory and hardware multiplication and division. Most S-100 peripheral devices can be used without degrading the 8086 performance. The EPROM-I/O interface includes a terminal-oriented monitor and serial and parallel ports. All products come completely assembled and tested. A kit option available for the RAM card allows the user to supply 2102s. For more information contact Tecmar, Inc., 23414 Greenlawn Ave., Cleveland, OH 44122. *Circle No. 103*

Findex Unveils New Business Computer

A new line of general purpose microcomputers has been introduced by Findex, Inc.

Features include a BASIC-language operating system; bubble memory mass storage; upper- and lower-case, alphanumeric plasma display; and integral printer. The portable unit weighs less than 20 pounds.

The major model in the Findex line, Model 256, incorporates a 256K magnetic bubble memory for mass storage, offering high capacity in a small, stationary, light-weight package, the company said. Bubble memory stores binary information in a stationary, magnetic garnet chip in the form of uniformly spaced magnetic domains, or "bubbles". These bubbles are arranged in closed loops, and the presence of a bubble in the loop represents a binary one, whereas the absence of a bubble represents a binary zero.

As a lower-cost alternative to the bubble memory, the Findex Model 180 offers 180K bytes of mass storage in a microfloppy disk housed inside the computer case. Built-in memory in this system is the same as in the Model 256, and includes 48K bytes of dynamic RAM and 1K byte of static RAM, expandable to over 2 megabytes, plus 8K bytes of ROM, expandable to 16K. External disk drives can be interfaced with Findex to provide additional megabytes of mass storage to meet various business requirements.

Findex also contains both serial and parallel I/O capability for interfacing with a wide range of peripheral units, including external printers, cassette recorders, other Findex units and larger computers.

A flat, gas plasma disply panel provides six rows of forty dot-matrix upper- and lower-case characters. The field of view can be rapidly scanned over any data base, making a large screen unnecessary for most applications, the company said.

Findex can automate all accounting functions (receivables, payables, general ledger and payroll) and can handle order entry, inventory control, sales analysis and many kinds of business reports, according to the company.

The computer is designed to be carried from place to place in a typewriter-like carrying case. This portability brings the computer to the jobsite, or to locations previously considered impractical or impossible. For example, an insurance executive specializing in estate planning can design a program for the client right in the client's office, including the complex computations normally provided a day or two later by a big number cruncher, Findex said.

Business executives, office managers and operation managers also can have the computer right on their desk to keep them on top of functions for which they are responsible, such as orders, shipments and changes in inventory. Salesmen can have an extensive data base of models, prices, delivery dates, discounts and other relevant information with them on their sales calls. Retail stores can perform and store one or more days' transactions at each station, for later transmission to a big computer. Bank tellers can also have their own computers for versatile independent operation, but with the ability to interface to a central computer.

According to the company, other applications include scientific, engineering and design computations; take-offs and other computations required by contractors and architects; real-estate listings and transactions; tax consulting; parts and product distribution; and business operations.

The Findex system can be expanded for multi-use applications by adding Findex Model 49 units as interactive terminals. Each intelligent terminal would provide a 49K RAM for scratch-pad computing, independent of its tie-in to the central Findex.

Findex models are priced from about $4900. Lease purchase arrangements are available for about $150 per month. For more information contact Findex, Inc., 1625 West Olympic Blvd., Suite 707, Los Angeles, CA 90015; (213) 7-FINDEX. *Circle No. 104*

Small Business Computer System

An expandable computer system with software for automating small business accounting procedures was introduced by Computer Management Group. The Omicron Business Computer is a Zilog Z-80-based small business computer featuring system architecture that permits expansion as business volume increases. The unit can be programmed in BASIC, FORTRAN and COBOL, and is capable of running IBM 360 and 370 COBOL programs. Software includes inventory control, order processing, payroll, accounts receivable and payable, and general ledger.

The basic Omicron system consists of a 64,000 character Z-80 computer, 2 floppy disks, 160 character/sec printer and an interactive CRT display. It can be expanded with multiterminals and printers, 10 million character hard disk system, teleprocessing, optical scanning and word processing.

Computer Management's system is priced from $15,000 with software. A 6 year leasing plan is offered, and literature is available upon request.

For more information contact Computer Management Group, Inc., Norm Sorois, Vice President, Elm Street, P.O. Box 698, Merrimac, NH 03054. *Circle No. 105*

PROM Programmer Expands COSMAC Development System

A new hardware and software package (CDP18S480) for programming industry-standard PROMs, designed to work

with RCA COSMAC Development System (CDS II) CDP 18S005, is now available from RCA Solid State Division.

The PROM Programmer Package includes a plug-in module for the CDS II and software containing a versatile operating program. The system will rapidly program Intel 2704, 2708, 2716, 2758 or other equivalent PROMs. The 2704, for example, can be programmed in less than one and one-half minutes, RCA said. The programmer facilitates rapid programming of many PROMs onto other PROMs.

Differing only in the software media with which they operate, three versions of the PROM Programmer are offered by RCA. The disk-based version is designated CDP 18S480; the paper-tape version is designated CDP 18S480V1; and the magnetic-tape cassette version is designated CDP18S480V2. Thus, the PROM Programmer will work with any configuration suitable for the CDS II, the interactive software and hardware prototyping system for the development of products based on the RCA 1800 family of microprocessor parts, the company said.

The CDP18S480 software provides a variety of operations, including: programming a PROM from a file; programming a PROM from another PROM; verifying a PROM against a file; verifying a PROM against another PROM; verifying erasure of a PROM; combining two PROMs to program a larger one; saving PROM data on a file in reloadable format that can also be used for masked ROM production; and performing any of the above operations with either positive (non-inverted) or negative (inverted) logic.

The program is supplied in both object code and assembly language source. An Operator's Manual, supplied with the Programmer, gives installation instructions and details of operation.

In single quantities the RCA PROM Programmer CDP 18S480 is priced at $695 (U.S. only).

For further information and copies of the PROM Programmer CDP18S480 Product Description PD22 or the COSMAC Development System II CDP18S005 Product Description DD16, contact RCA, Solid State Division, Box 3200, Somerville, NJ 08876; (201) 685-6380. *Circle No. 106*

Outpost 11 Features Extensive Software

Outpost 11 Data System from Tano Corp. provides basic business computer hardware for $1995. Optional peripherals and extensive business applications software add to the system's flexibility.

Hardware features of Outpost 11 include: 12" diagonal CRT with 24 x 80 character display and 7 x 9 dot matrix ASCII characters; typewriter-like keyboard; one floppy disk drive; CPU-MC6800 microprocessor; 32K bytes RAM (expandable to 64K); EIA RS-232-C serial to terminal or modem; and selectable baud rate. Optional hardware includes line printer, second floppy and wood-grain stand.

Outpost BASIC features program SAVE and LOAD with file names, program MERGE and CHAIN, ON ERROR statements, string variables, trig and math functions, OPEN and CLOSE file commands, and GET, PUT and FIELD statements.

Business software packages are available from Tano for $99 each on floppy disk. Applications packages available include general ledger, accounts receivable and payable, payroll, inventory, job costing, mailing list, medical billing/insurance, time utilization, service station accounting, real estate multi-list, church profile and contribution, stock management, country club billing, insurance agency accounting, employment agency system, vehicle maintenance, automotive accounting system, business analysis system, fixed asset system, credit union installation and word processing system.

For more information contact Tano, 4521 W. Napoleon Ave., Metairie, LA 70001; (504) 888-4884. *Circle No. 107*

PERIPHERALS

System 3400 Pixel Resolution Expanded

Pixel resolution of 1280 x 1024 is available on the System 3400 Graphic Display from Lexidata Corp. Applications include PC design, IC design, engineering modeling and business graphics. Both color and B&W graphics are generated in the built-in, 80 nsec. cycle time, 12-bit microprocessor. Multiple planes of graphics may be displayed separately or in combination.

Full 1280 x 1024 resolution is displayed on the screen at 30 Hz interlaced refresh rate. If 60 Hz refresh is required, a scrollable, zoomable window of 604 x 512 may be displayed from the 1280 x 1024 buffer. The System 3400 allows refreshing of the full memory even if the picture displayed is only a subset of the full memory.

The System 3400 with 1280 x 1024 memory starts at $10,130. For further information contact Lexidata Corp., 215 Middlesex Turnpike, Burlington, MA 01803; (617) 273-2700. *Circle No. 108*

GPIB 3000 Interface Bus from Tandberg

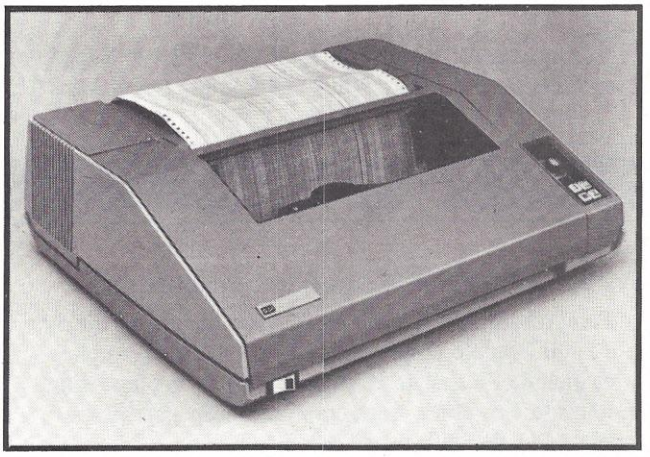
Tandberg Data Inc. has introduced the GPIB 3000, a General Purpose Interface Bus Cartridge Recorder utilizing the DC300A/DC300XL cartridge media. The new interface bus for the TDC 3000 Digital Cartridge Recorder allows users of test equipment, calculators and other types of bus-compatible instruments to record on tape, said the company. The GBIP 3000 adds data recording and playback capabilities to instrumentation and data-acquisition systems without building custom interfaces, Tandberg officials said.

The new drive can be plugged in directly to the standard IEEE-488 interface bus available on calculators, minicomputers and other types of measurement instruments. The drive uses no belts, gears or brakes, relying instead on a single direct-drive servo motor. Read-while-write data checking is performed while recording, ensuring error-free recordings. Four independent tracks are provided. Data capacity exceeds 2 megabytes with standard cartridges. A table-top cabinet adaptable to rack mounting is available for both single- and dual-drive models.

Unit price of the GPIB 3000 drive is $3620. For additional information contact Tandberg Data Inc., 4060 Morena Blvd., San Diego, CA 92117. *Circle No. 114*

SSI 200-lpm Matrix Printer

Southern Systems Inc. (SSI) has added a 200 line per minute matrix printer to its line of medium and high speed impact printers. The M-200 is compatible with all DEC,



Data General, Hewlett-Packard, Interdata and other mini systems. The unit is also available with an optional S-100 compatible mode or with an asynchronous RS-232 serial interface.

M-200 offers a 14-pin wire matrix head which combines the flexibility of a single head with the speed and long life of multiples, SSI said. A diagnostic display permits continuous monitoring of machine status.

SSI's M-200 prints in either expanded, condensed or standard characters and provides up to six clear copies. Forms are easily loaded from front or bottom. The SSI matrix printer is particularly well suited for small business computers, distributed data processing in dedicated terminal systems and for operation with microprocessor-based systems, the company said.

For more information contact Southern Systems, 3000 N.E. 30th Place, Fort Lauderdale, FL 33306; (305) 561-5226. *Circle No. 115*

Vista Double Density Diskette

The Vista Computer Company has developed a double density, 5¼" diskette system. The total package for each V200 Series Minifloppy Disk System includes: minifloppy disk drive(s) with DC power regulator board, case and internal power supply; an S-100 bus controller card that plugs into the computer and controls up to three hard-sectored double-density double-sided disk drives; an I/O cable that connects the controller to the drives (Vista customizes to individual I/O requirements); system software composed of the Vista CP/M (VOS) Disk Operating System and BASIC-E compiler (CBASIC optional) recorded on 5¼" diskettes; operating/instruction manuals (a complete hardware and software documentation describing the V200 system).

The V200 Series operates with any Z-80/8080-based computer system containing 24K of main memory, said company officials. With CP/M you can store up to 64 dynamically allocated, named files on each diskette. A file size can be up to 200K bytes.

The fast-access, on-line storage of the V200 system provides instantaneous program loading and dumping; sequential and random file access; context editing of programs and text; dynamic debugging of programs; program assembly; and batch processing. Each hard-sectored 5¼" diskette holds up to 200K bytes/surface. The system comes completely assembled and tested, and it can be run simultaneously with a North Star controller without interference.

For more information contact George McMurtry, President, Vista Computer Company, Dept. P2, 2807 Oregon Court, Torrance, CA 90503; (213) 320-3880. *Circle No. 116*

Peripheral Module Converts Micros to Digital Integrated Circuit Testers

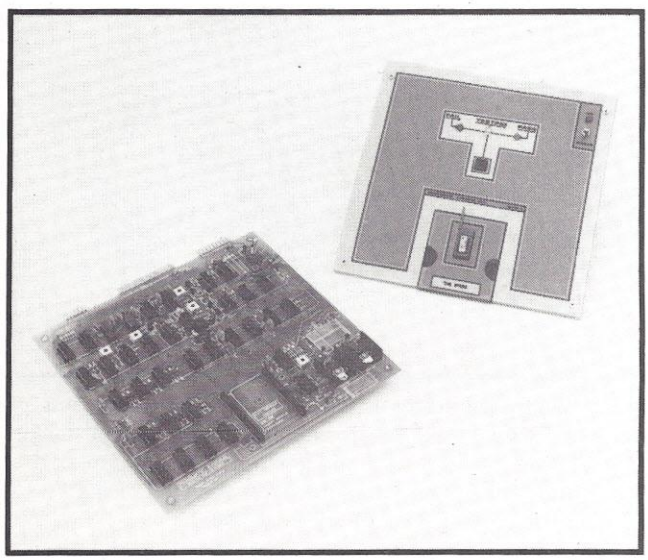
Pragmatic Designs, Inc. has introduced ICTM-1, a peripheral allowing microcomputers to be used as digital integrated circuit testers. The tester performs both functional and DC parametric tests on TTL, low power Schottky, Schottky, CMOS and NMOS devices. It can also be used to test small circuit boards and subsystems with up to 22 I/O lines.

ICTM-1 measures device fan out, fan in, supply current and other parameters. Active loads on output pins insure that devices with normal, open collector and three state output configurations can all be tested without any external components. Tests can be performed with power supply levels from 4.5V to 5.5V, allowing for worst case testing.

ICTM-1 interfaces to the host computer through one input port and two output ports. Plug-in personality modules with zero insertion force sockets automatically configure the tester for 14, 16, 18, 20, 22 and 24 pin devices, with a user wireable module also available. An optional interface card and cable is also available for computers using the S-100 bus.

Included with ICTM-1 are the software drivers necessary to use tester functions in device test plans. These drivers are provided in 8080/8085/Z80, 6502 and M6800 assembly language. Also available for 8080/8085/Z80 users is TBASIC (Tester Extended BASIC), a high level control language. TBASIC allows users to quickly develop test programs using a set of commands which are extensions of the BASIC programming language. TBASIC programs to test many standard integrated circuits will be available to TBASIC owners, the company said.

ICTM-1 is available in kit form for $349.95 or $499.95 assembled and tested. Each ICTM-1 includes one personality module of the users choice; additional personality modules are priced from $19.95 each. The S-100 interface module, IF-1, is priced at $89.95 kit, $119.95 assembled and tested. The TBASIC interpreter is priced at $49.95. A complete set of assembly, user and software manuals is



available for $15 (refundable with order). For more information contact Pragmatic Designs, Inc., 711 Stierlin Road, Mountain View, CA 94043; (415) 961-3800. *Circle No. 117*

New DMTP-9 Ticket Printer

Practical Automation has added the DMTP-9 ticket printer to its Matri-Dot product line. This new device offers users the ability to print text and graphics on IBM size tickets, forms or cards. Like other Matri-Dot printers, the DMTP-9 uses Practical Automation's field proven dot matrix impact print head to print up to 48 alphanumeric characters per line and 39 text-spaced or 59 graphic-spaced lines. A precise stepper motor controls line spacing density. The printer also offers multicopy capability, logic level control inputs, adjustable card guides and an optional ribbon mechanism.

The DMTP-9 is specifically designed for use in microprocessor-based medical or analytical instruments where the ability to print text and graphics is of significant value. However, the printer is also suitable for automated time card, inventory, production control and weighing systems. In all these applications, the printer can be mounted verti-

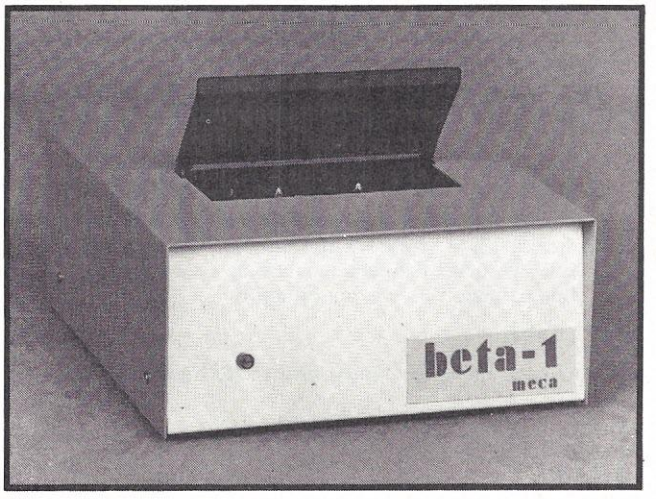
cally or horizontally to suit the particular manner of use.

Options include an automatic reinking and self-reversing ribbon mechanism which eliminates the need for pressure sensitive tickets. The basic DMTP-9 is complemented by a full line of optional support electronics, including interface electronics, power supply and cabling. Bulletins 914 and 920 provide further details about the DMTP-9 and associated options. List Price is $310. For more information contact Fred Simonds, Asst. Sales Mgr., Practical Automation, Inc., Trap Falls Road, Shelton, CT 06484; (203) 929-5381. *Circle No. 118*

Tape Storage Device from MECA

A universal tape storage device that interfaces to most popular microcomputers, including non-S100 bus system, is available from MECA. Called BETA-1, this unit plugs directly into a standard 8-bit parallel port. Serial port connection is offered as an option. The high speed digital tape transport features random seek at more than 100 inches per second, with average access times in 10 seconds or less, and loading time at 8000 bits per second. An option is available to permit loading speed of 16,000 bits per second.

The unit has an internal 8035 microprocessor with a 1K byte program and high level tape operating system. De-



livered fully assembled and tested, the BETA is priced at $399 in single units. Quantity discounts are available to qualified dealers. For more information contact MECA, 7026 O.W.S. Road, Yucca Valley, CA 92284; (714) 365-7686. *Circle No. 119*

Data Acquisition Modules from Connecticut microComputer

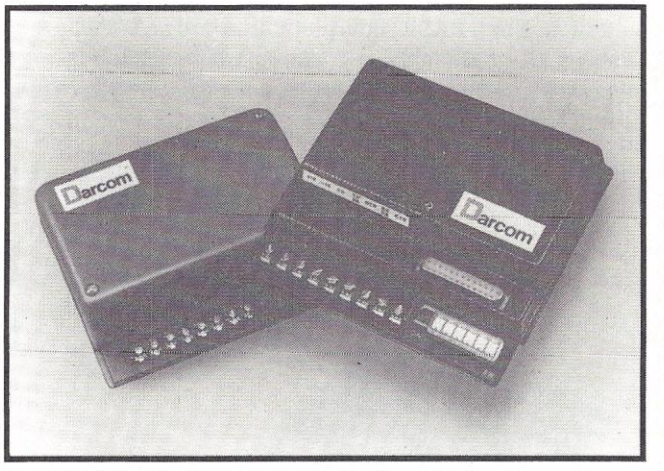
Connecticut microcomputer has introduced a line of Data Acquisition Modules for the PET, TRS-80, KIM and other microcomputers. Modules available include a PET interface, KIM Interface, TRS-80 interface, analog input module, manual and display module, manifold module, analog manifold module and expander module. For more information contact Connecticut microComputer, 150 Pocono Road, Brookfield, CT 06804.

Two Telecommunication Products from Darcom

Darcom, Inc. has entered the small computer peripheral market with two telecommunication products: the D101 Data Coupler and the D201 Modem.

The D101 Data Coupler provides an automatic interface between a telephone line and customer-owned equipment. such as a modem or data terminal, said the company. It features standard Bell CBT functions, operates from a single +5 volt power supply and requires no adjustment. Ring indication, off-hook control and balanced data transmission are standard features. The data coupler is registered as required by Part 68 of the FCC Rules and Regulations. Its suggested retail price is $149.95.

The D201 Modem converts digital data to FSK suitable



for telephone line transmission. It features automatic answer and disconnect, originate and answer modes and standard RS-232 interface. The modem operates full duplex to a 300 data rate and is compatible with the D101 Data Coupler. Its suggested retail price is $249.95.

For more information contact Bob McCallie, Manager, Consumer Marketing, Darcom, Inc., 268 N. 115 Street, Omaha, NE 68154. *Circle No. 120*

TRS-80 Interface

JC Enterprises has announced the A828 AC-P/TRS-80 Input/Output Interface, designed to expand the TRS-80 capability by providing 4 channels of programmable AC power control, 600W each channel, 1600W total. The A828/TRS-80 combination can be used to sense switch closures, photosensors and 5V logic levels, drive LED displays, operate motors, solenoids, alarms, and so forth, said the company.

The A828 is complete with a self-contained 5V power supply, interface cable, I/O port connector cable, metal enclosure and sample programs. The assembly is complete, tested and ready to use by simply connecting the interface ribbon cables. The 8 bit input port is addressed with INP (0) function of Level II BASIC, or with T-BUG and Level I BASIC. The 8 bit latched output port is addressed with OUT O, N command of Level II BASIC, or with T-BUG and Level I BASIC. Ports may be programmed to respond to other addresses, 1-31, by installing jumpers on the board. In

this way, several sets of ports may be daisy-chained onto the computer's ribbon cable.

A self-contained 5V power supply prevents loading of the TRS-80. Five volts at 150 ma is present at the port connector for powering user circuits. Included in the $165 price is a TRS-80 Interface Cable and I/O Port Connector Cable. (Expansion Cable in place of TRS-80 Interface Cable is optional at an additional $6). For more information contact JC Enterprises, P.O. Box 23445, San Diego, CA 92123; (714) 277-6585. *Circle No. 121*

MSI Portable Terminal Memory Expanded

MSI Data Corporation has increased the memory size of its new handheld portable terminal, the MSI/88, to 64,000 characters and has expanded the memory segmentation feature of the terminal to fourteen segments. Each part of the MSI/88's segmented memory can be treated independently of the others for as long as the user desires. This feature allows the terminal to handle different problems or to store data from different departments up to a maximum of 14 without data loss or damage, the company said.

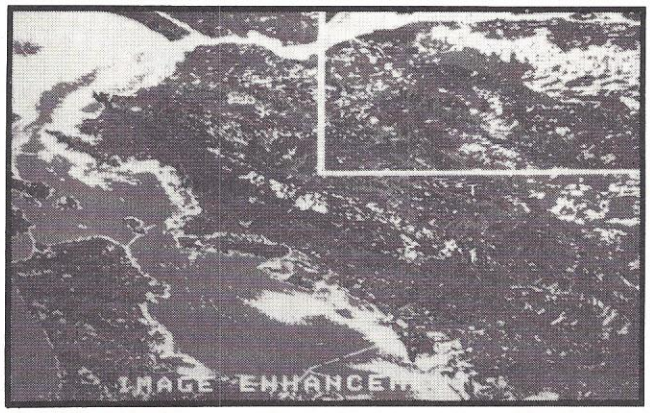
Through the use of a selection or page key, the user of the MSI/88 can transmit, edit or erase data or search the memory. For further information contact MSI Data Corp., 340 Fischer Ave., Costa Mesa, CA 92626; (714) 549-6000. *Circle No. 122*

Color Display Computer from Aydin Controls

Aydin Controls' Model 5216 color graphics display computer is a microprocessor based unit featuring both hardware and software modularity. Applications range from complex stand-alone imaging and graphic systems to simple interactive terminals for industrial, commercial, military and educational use. The system may be configured to drive

single or multiple monochrome or color CRT monitors.

The Model 5216 is Aydin Controls' third generation full color graphics display system that includes features most requested by users. The unit incorporates the Intel 8086 16-bit microprocessor as its primary control element. The user has access to the microprocessors (up to 16 depending upon the system configuration) via the Aydos operating



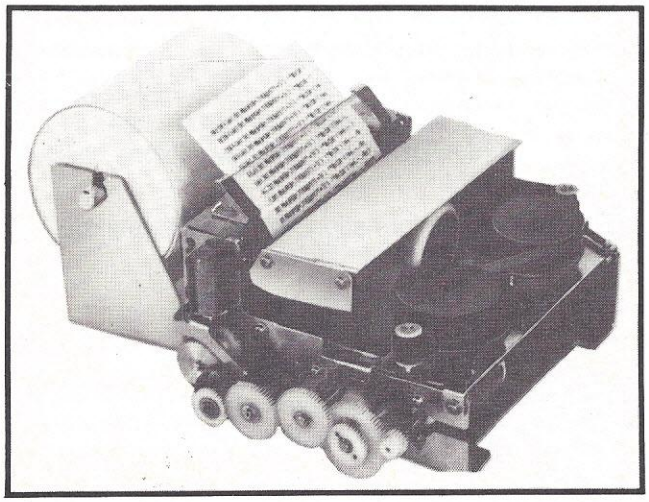
system. Firmware is used to set system configurations.

Other special purpose software packages such as FORTRAN, BASIC, assemblers, diagnostics, text editor are also offered. An extensive line of hardware modules facilitate various system configurations consistent with application and budget. Resolutions of 256 X 256 to 1024 X 1024 are available with up to 16 MOS RAM refresh memories per system. Interfield flicker is eliminated with "fast scan" 60 Hz repeat field formats at resolutions of up to 1024 X 512. Graphics generation is via firmware or optional high speed hardware. Alpha-numerics may also be firmware generated or completely interactive via program store memory.

For more information contact Aydin Controls, 414 Commerce Dr., Fort Washington, PA 19034; (215) 542-7800. *Circle No. 109*

New Addition to Epson Dot Printer Family

C. Itoh Electronics, Inc., has announced the new Model 511L serial impact dot matrix journal printer, manufactured by Shinshu-Seiki under the trade name Epson. With its 3.1 mm high character size, 6.0 mm line spacing and print speed of 2.2 lines/sec., the 511L can be used for printing tickets and for rapid, accurate intercommunication in large restaurants, hotels, and so forth.

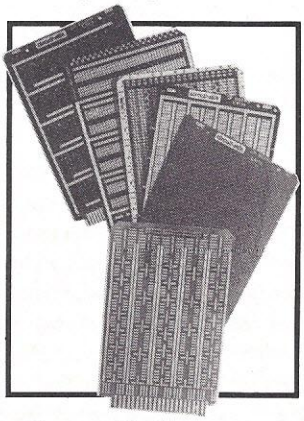


The 511L has 5 million lines MCBF (mean cycles before failure) and print head life of 100 million characters (5 x 7 font, 25 C). Its font has 480 dot positions available, maximum 240 dots printable, per wire per line (7 wires).

Price for sample is $230. For more information contact C. Itoh Electronics, Inc., 280 Park Ave., New York, NY 10017; (212) 682-0420. *Circle No. 110*

COMPLEMENTS

Drilled Boards Offered by Bishop Graphics



A line of numerically controlled drilled-and-etched general-purpose printed-circuit boards and accessory items is now available from Bishops Graphics Company. The new product line, "Circuit-Stik", contains an array of "state-of-the-art" general purpose PC boards designed for electronic packaging, breadboarding and prototyping use.

Holes in the Circuit-Stik boards are drilled by automated, numerically controlled equipment, thus offering the advantage of a drilled board over a punched board, says the company. These advantages are said to include more accurately-located holes free of fractured edges, "whiskers" and dimples. Bishop says defeats like that make proper insertion of terminal pins difficult and solder connections unreliable. Circuit-Stik, on the other hand provides better support for components, maintains Bishop.

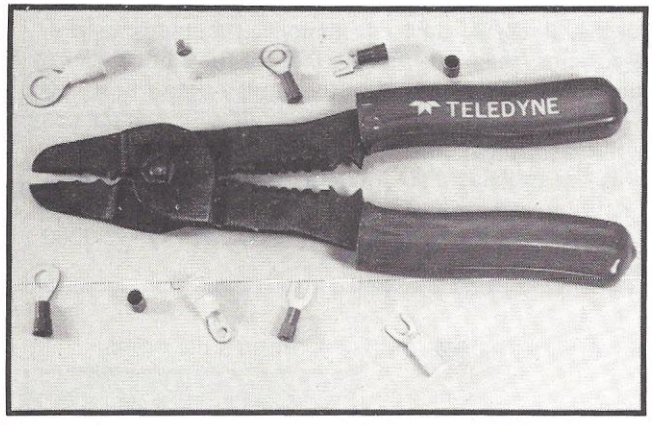
Information on Circuit-Stik is available from Bishop Graphics, Inc., 5388 Sterling Center Drive, PO Box 5007, Westlake Village, CA 91359; (213) 991-2600. *Circle No. 111*

Seven Features in New Hand Crimper

The TDY-101 Hand Crimper from Teledyne Ansonia offers seven features for wire and terminal users.

Standard crimping dies handle all types of insulated and non-insulated terminals in the 22-10 AWG wire range. A new extra indent crimping jaw allows for heavy duty crimping of uninsulated terminals. Separate ignition terminal crimping jaw is designed to crimp insulation tighter to wire. Extra long length of tool gives better leverage when crimping or cutting. Separate cut-off blades for six different sizes of bolts and studs are all in one blade section. Six clearly marked dies allow for stripping insulation from 22-10 AWG wire. And the cut off blade has precision cutting edge and is located right up front for easy access into tight places.

The crimping tool is precision machined from heavy duty steel. Oversized adjustable rivet assures tight professional action without slippage. For information contact



Robert S. Sobolewski, Teledyne Ansonia, Solderless Connector Division, One Riverside Drive, Ansonia, CT 06401; (203) 735-9311. *Circle No. 112*

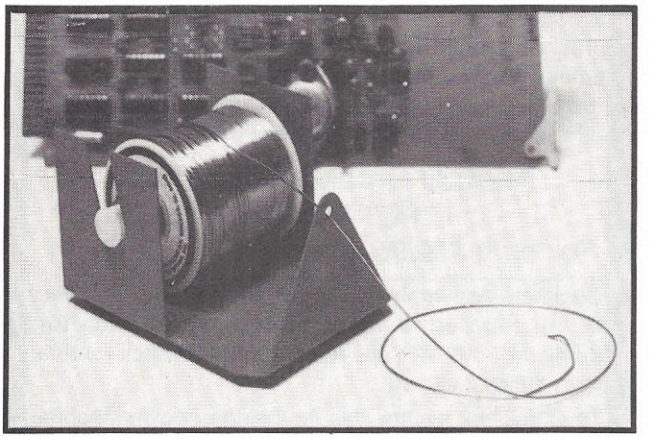
Calculator Stand

Answering a need of hand calculator owners, the Cal-Convertor calculator stand frees hands while the calculator is used and adjusts to different positions to suit lighting conditions and eliminate glare.

For more information contact Cummins Enterprises, 99 E. Magnolia, Suite 108, Burbank, CA 91502; (213) 843 6257. *Circle No. 113*

Solder Spool Holder Eliminates Unraveling

A metal holder that keeps solder spools in place and prevents solder wire from unraveling has been introduced by Efficiency Products Corporation of North Chelmsford, MA. Solder Mate is a portable, solder spool holder that permits the user to conveniently locate the end of the wire without having to search for it. Incorporating a non-slip base, the

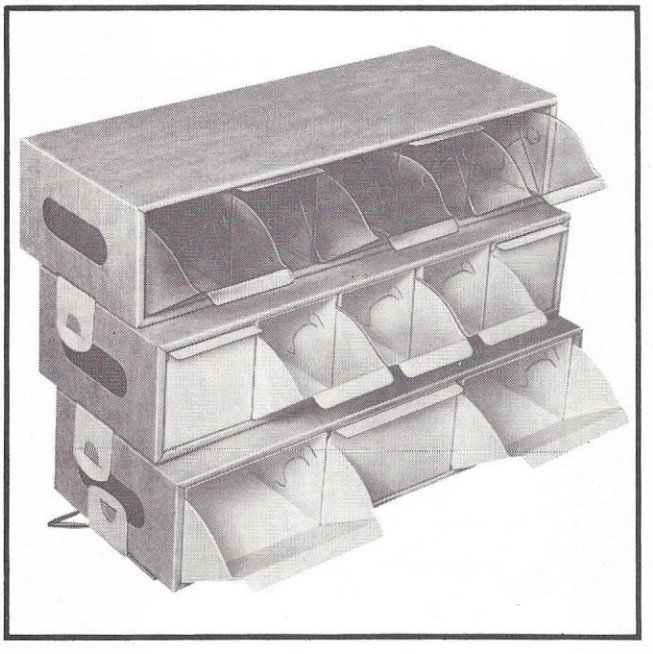


all-metal dispenser permits solder to be drawn out easily. Weighing 6 oz, Solder Mate measures 4" L x 3 1/8" W x 2 3/4" H and holds solder spools in all sizes and diameters. The solder spool is loaded by dropping it into place and feeding the wire through a dispenser hole. Solder Mate is priced at $4.95, with quantity discounts available. Efficiency Products Corporation, 2 Kennedy Drive, North Chelmsford, MA 01863; (617) 251-8714. *Circle No. 123*

New Cubby Aids in Small Parts Organization

The Cubby is a new small parts organization and handling system from Shell Container Systems.

Standard mini-system units of the Cubby include a plastic coated white fibreboard shell with built-in plastic connector straps, and users' choice of either five see-through plastic cubbies or three white plastic cubbies inside.



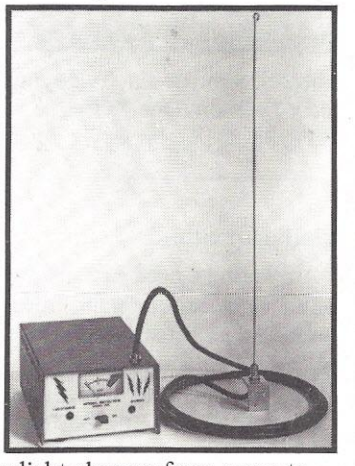
Each entire mini-system package ships/folds flat and resists grease and moisture. Built-in plastic connector straps allow interlocked stacking with other mini-system units. The straps hook out of the way when not used.

When the mini-system units are assembled, there is no need to remove the cubbies from their respective shells; the special hopper-action styling feature permits easy access and provides positive, no-spill closure.

An optional steel stand positions the Cubby mini-systems in a 20-degree gravity-feed mode. The stand can be placed across the hopper-action faces of the unit cubbies to act as a lock when the mini-systems are in transit or storage.

The Cubby and cubbies can be produced in custom configurations without a mold charge; free design and sample service are available. Free literature provides details. For more information contact Shell Container Systems, Box 78, Race & Ridge Streets, Ambler, PA 19002; (215) 542-9200. *Circle No. 124*

Storm-Warning System for Computer Rooms



Computer rooms no longer need a dedicated TV screen to detect electrical storms. RAK Associates has a storm indicator to solve such a problem. The 120 VAC powered unit measures storm intensity. The unit also indicates storm activity within a 30 mile radius. The flashing of a green indicator light and the chirping of a buzzer occurs with each stroke of lightning. If the storm intensifies, the warning light changes from green to red. At the rate of 10 or more per minute of the red warning light, the buzzer will emit a steady blast. An external antenna allows remote monitoring of storms. Price of the unit with external antenna and standby internal battery is $289. For additional information contact RAK Associates, PO Box 222, Fort Atkinson, WI 53538; (414) 563-4205. *Circle No. 125*

Robot Car for Apple II

Robot I, a toy car from Heuristics, Inc., is radio-controlled from an Apple II using BASIC programs. The car's peripheral control card plugs into the Apple's peripheral bus connector. Commands such as "Left Turn" and "U Turn" can be programmed for the Robot I, then called up by voice when desired. Using the computer to store sequences of commands allows the car to implement more complex spoken orders, such as "Come Here".

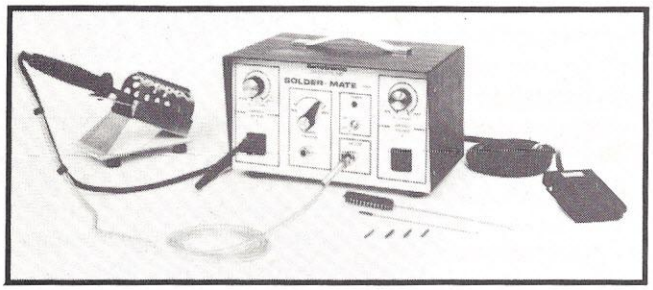
Available in red, white, yellow or blue, the 30 cm x 18 cm x 10 cm car requires one 9V radio cell. For more information contact Heuristics, Inc., 900 N. San Antonio Road, Los Altos, CA 94022; (415) 948-2542. *Circle No. 126*

High Flow Power Soldering/Desoldering System

Solder Mate 5000, is a self-contained, high flow power soldering/desoldering system made by Autotronic Pro-

ducts, Inc., a subsidiary of The Union Corporation.

The new unit is designed to easily and quickly remove components from electronic assemblies, permitting repair and re-use of printed circuit boards. Solder Mate 5000 also allows undamaged removal of components for testing or replacement. Controlled heat and suction remove solder deposits from component pins and terminals. Variable hot air

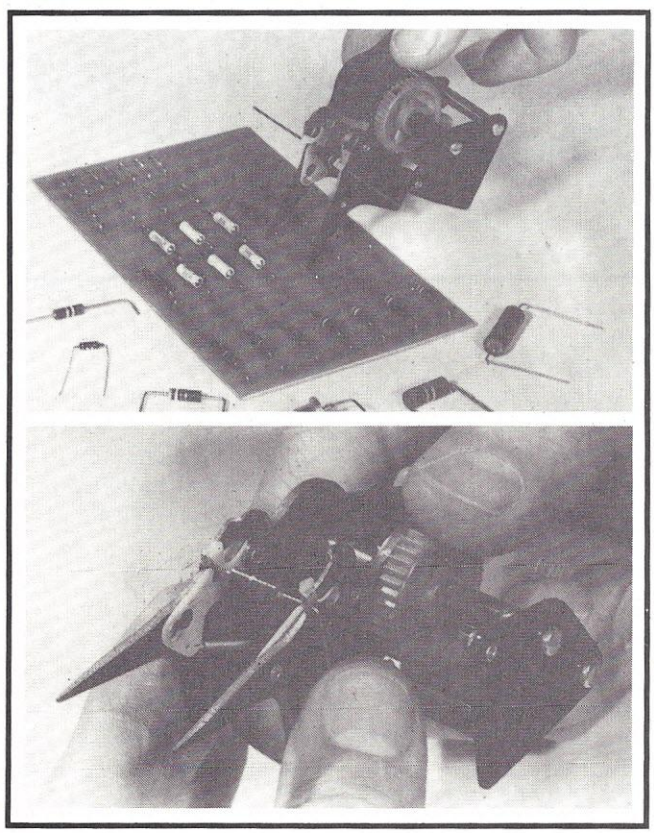


pressure is provided for re-flow soldering of flat packs and hard to reach connections. List Price for unit quantities is $499. Introductory prices, now is effect are $449. For additional information, write Autotronic Products, Inc., 3300 Lawson Boulevard, Oceanside, NY 11572. *Circle No. 127*

Lead Bender

Harwil Co. introduced a modification to its model N-300, a hand tool for fast, accurate bending of electronic component leads for insertion in printed circuit boards.

Model N-300 is now equipped with a finer pitch adjusting screw for smoother micrometer-type adjustment of



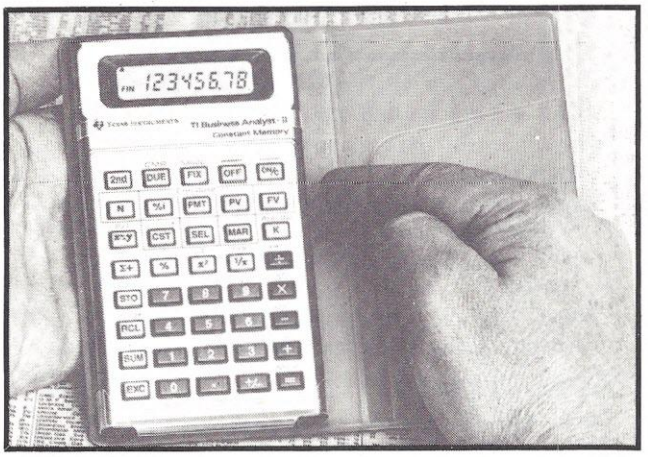
bend spacing. Standard features include strain relief between component and bend, replaceable plastic guides and rigid hard anodized aluminum frame.

Model N-300 eliminates measurement and trial and error bending of component leads. Matching pointers with eyelet holes in circuit boards by spinning knurled wheel with thumb automatically spaces bends for insertion of component into boards. Bends are formed by pressing leads against sides of pointers with thumb and forefinger. All axial lead components are accommodated, up to 1/2" diameter x 1-1/2" long with maximum distance between inside of bends of 1.725".

For free illustrated bulletin contact Harwil Corp., 1548 17th Street, Santa Monica, CA 90404; (213) 829-2310. *Circle No. 128*

TI Financial Calculator

Slimline Business Analyst-II, a multimode financial Calculator with advanced styling, Constant Memory and



Liquid Crystal Display (LCD), has been introduced by Texas Instruments Incorporated.

Business Analyst-II is expected to find use in the time-money management aspects of business, as well as in forecasting, reported a TI spokesman. Featuring separate operating modes for financial, statistical and profit margin computations, the unit also includes a constant key and non-volatile memory that retains data whether the unit is on or off.

Financial formulas preprogrammed into the Business Analyst-II eliminate the need for many tables and charts once required for business and financial management calculations. Special keys activate formulas for time-money and mortgage loan functions, such as compound interest, annuity payments, mortgage loans, investment yields, amortization schedules, accumulated interest, remaining balance and principle-interest split.

In addition, profit margin calculations are solved with the unit's "cost", "sell" and "margin" keys when two of the three values are known.

The BA-II has a suggested retail price of $45. For more information contact Texas Instruments Incorporated, Programmable Calculators, P.O. Box 53 (Attn: BA-II), Lubbock, TX 79408. *Circle No. 129*

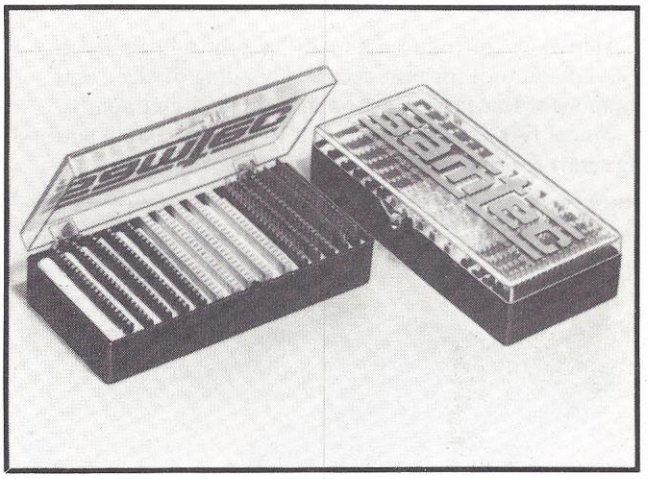
Cable Ripper

Vaco has introduced its cable ripper 70359C. This cable ripper slits the outer covering of all sizes of Romex and non-metallic sheathed cable, as well as measures wire sizes from 14 to 6 gauge. Individually carded, it is available in a standard package of six.

For further information contact Vaco Products Co., 1510 Skikie Blvd., Northbrook, IL 60062; (312) 564-3300. *Circle No. 130*

Strip Connector Kit

Samtec Electronic Hardware has introduced their strip connector kit. Users can socket any IC of DIP-Type component such as relays, op-amps or converters, regardless of size, shape, number of leads or lead row-spacing. Or they can make-up miniature high-quality connector sets using the mating socket and terminal strips included. Socket strips accept any component with lead-size of 0.015" to 0.022" cross-section. Terminations are PC solder and wire-wrap. Terminal strips mate with socket strips or can be used separately. Terminations included are PC solder-pot and slotted-head. Both strips have sockets/terminals on 0.100"



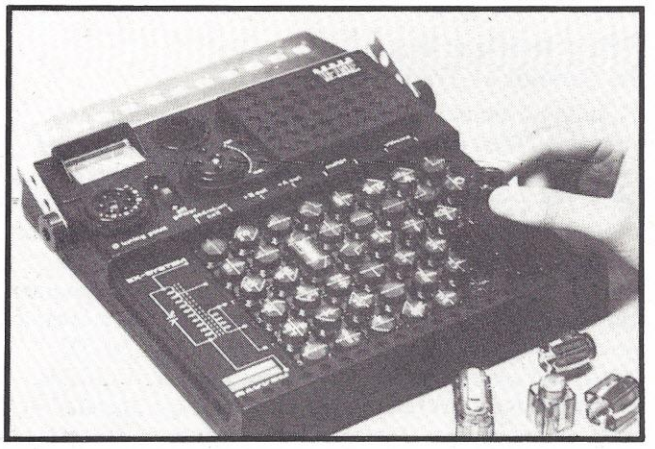
space in line; strips mount end-end or side-side on 0.100" spacing. Glass-filled polyester socket bodies meet U.L 94V-0 and snap apart for any shorter lengths – even 1 or 2 positions. Samtec Strip Kit allows mounting many components for which a socket may not be available. Used as a connector set, strips offer a miniature quick connector. Cost is $19 each at 1 quantity. For full specs and prices contact Samtec, Inc., 810 Progress Blvd., New Albany, IN 47150; (812) 944-6733. *Circle No. 131*

Electronic Kits

Takahashi and Associates has introduced a series of Modular Electronic Kits from Gakken called EX-Kits. EX-Kits come complete with electronic blocks snapped together in a matrix design to form circuits representing up to 150 different electronic projects.

Projects range from a wireless microphone to transistor

tester, AM radio, amplifier, radio and microphone mix, Morse Code circuit, sound level meter and basic computer circuits. The kit lets you trace the flow of current, discover the function of each component, learn the language and logics of electronics. Each kit is packaged with electronic building blocks, earphone, all accessory wires and an illustrated manual.



Completely safe and non-toxic, the EX-Kit series require no soldering, wiring, mechanical connection or exposed wires. Each electrical component is encapsulated in a transparent block with the electrical symbol and value marked on the top. EX-Kits are powered by 4AA penlite batteries. The strong ABS plastic case has built-in antenna and carrying handle.

For more information contact Takahashi and Associates, Inc., 3183-G Airway Ave., Costa Mesa, CA 92626; (714) 557-1080. *Circle No. 139*

Wiring Tools

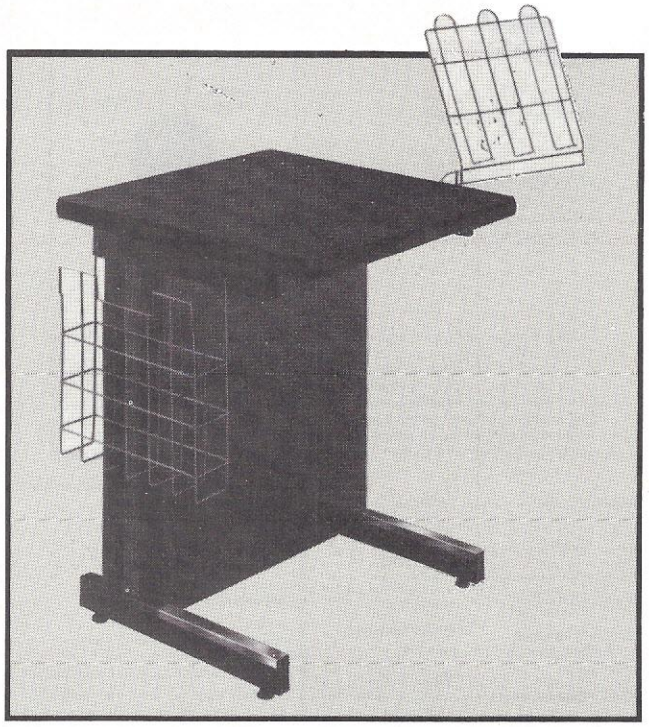
Two new wiring tools have been added to the line of Diamond Tool and Horseshoe Co. The 8-1/4-inch 5-in-1 tool (WS19) combines a plier, wire stripper, scissors-action wire cutter, bolt cutter and wire crimper in one tool. It strips wire clean in sizes 10 through 20 and cuts bolts in six sizes, leaving a perfect rethread.

The 6-inch wire stripper/cutter (WS15) has a plier tip, stripping blades for wire sizes 10 through 20 and a half-inch scissors-action wire cutter. Both tools have lifetime pivot bearings and cushion vinyl handles, with gauges marked on the tools. For more information contact Diamond Tool and Horseshoe Co., PO Box 6246, Duluth, MN 55806; (218) 628-2264. *Circle No. 140*

Universal CRT Stand

The Maine Manufacturing Company's universal CRT Stand is designed for use in the data processing industry. Data-Mate Model 10752 features unitized welded steel base, black textured paint finish with wood grain trim strips and wood grain plastic laminate top with bullnose vinyl edging.

The 10752 is designed for maximum operator efficiency while minimizing floor space requirements. It is universally

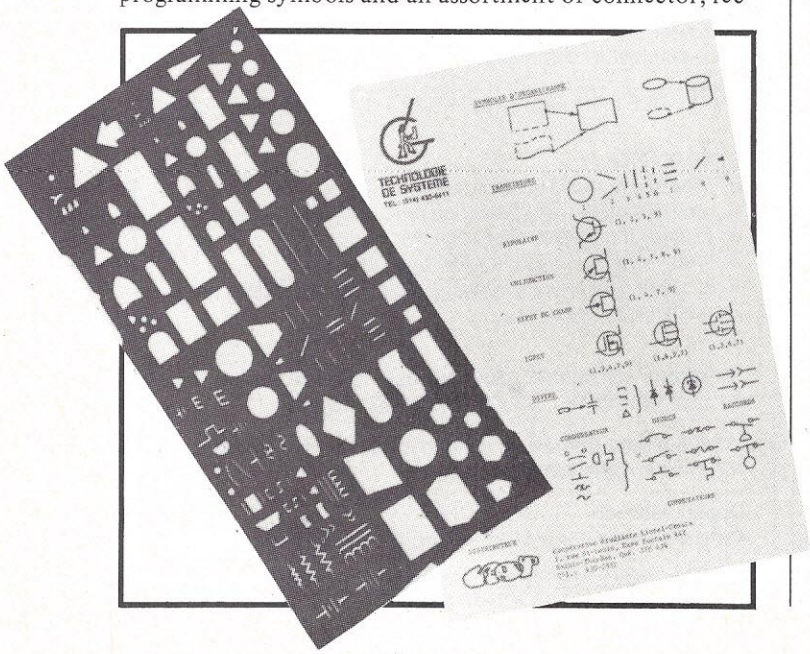


adaptable to any make CRT. The unit is complete with a side hanging in/out work holder, left or right mounted adjustable copy holder, wear guards on lower feet and rubber cushioned levelers to assure stability. For further information contact The Maine Manufacturing Company, Industrial Products Division, 46 Bridge Street, Nashua, NH 03060. *Circle No. 132*

Systemplate from Coop-Lionel-Groulx

Coop Lionel-Groulx of Quebec has introduced a new systemplate for drawing schematics diagrams.

The systemplate will provide standard logic symbols 1/4" and 3/8" size, electronic symbols, all types of transistor symbols (2 sizes), computer system symbols, usable size programming symbols and an assortment of connector, rectangle, square and triangle symbols.



The systemplate comes in a convenient 4" x 8" size in its own user's instruction envelope; it's made of a flexible plastic material. Price is $5 U.S. For more information contact Coop Lionel-Groulx, 1, Rue St-Louis, P.O. 442, Sainte-Therese, Quebec, J7E 4S4; (514) 430-2931. *Circle No. 133*

A New Robot is Making the Rounds at Trade Shows

Android Amusement Corporation is marketing a new company-owned and company-operated robot as an attention getting attraction at electronic fairs, expositions and so forth. The company claims such following characteristics for its mobile "show-sparkler": the robot can transmit commercial messages and music; it can play video games through a color TV screen in its chest; it can draw elaborate modern-art graphics on the same TV screen; it has a calculator capability and the tape itself is displayed on the TV screen; and custom games can be programmed to advertise client's products. At the present the robots are operated by radio remote control. The company says it soon expects to be able to interface the robot to a computer so that it will perform its tricks on its own internal program. Further information is available from Gene Beley, Android Amusement Corp, 2324 Lenta Lane, Arcadia, CA 91006; (213) 445-5330. *Circle No. 134*

Two Accessories Available for HP Series E Calculators

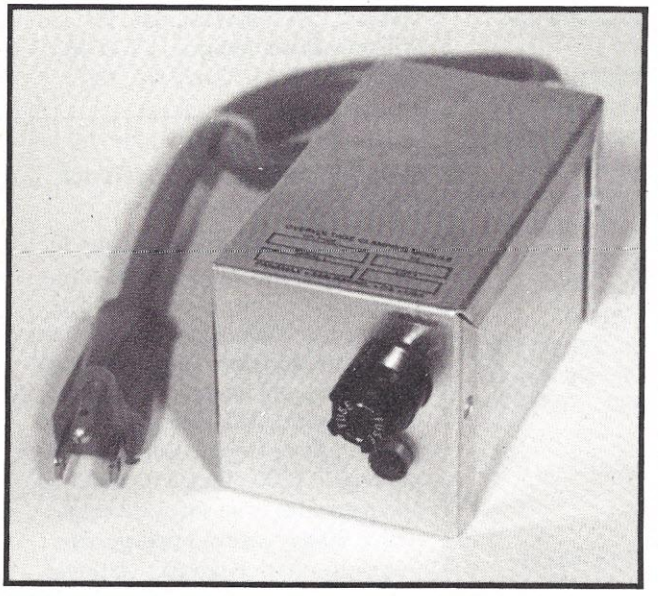
Two new optional accessories, a reserve power pack and a DC recharger for HP Series E calculators, are available from Hewlett-Packard Company.

The reserve power pack, Model 82103A, is a small desktop unit that comes with an extra set of batteries. Reserve power packs offer the convenience of having an extra set of fully charged batteries on hand. The Model 82103A is priced at $15.

A second way to assure a continuous power source for an HP calculator is through a DC recharger. The new Series E Model 82144A features two types of cords, one with a cigarette lighter adaptor and another with the common spadelug type terminals. Input voltage can range from 9 to 16 volts DC. Price is $27. For more information contact Inquiries Manager, Hewlett-Packard Company, 1507 Page Mill Road, Palo Alto, CA 94304; (415) 856-1501. *Circle No. 135*

Voltage Suppressor Protects Against Power Surges

Switching of inductive loads such as air conditioning, transformers, inductive heaters, air flow motors, fluorescent



ballasts, etc. or down-line lightning strikes can cause short term (1-1000$_u$ sec) high voltage spikes (110% - 500% of line voltage) on power lines. Such transient over-voltages can pass through power-supply transformers, filters and regulators to appear in an attenuated form on DC supply busses. The net result is malfunctioning equipment, erratic output, increased down-time and service costs.

The Panamax 120 VSP is a shunt-fed device that clamps transients at 10% above the nominal peak-to-peak line voltage. As a retrofit device, it is wired into the 120V RMS power buss or plugged directly into an adjacent wall outlet. As an OEM component, it is available as a small (approximately 1" x 1" x 2") epoxy unit with two leads, protected by a line fuse. Unit price is $65 and it is available from R & K Interprises, 405 Alberto Way, Los Gatos, CA, 95030; (408) 358-1113. *Circle No. 136*

Collapsible Lead Flushcutter

To stop operators from trying to cut wire larger or harder than 14 AWG copper and nicking cutting edges or actually breaking the handtool, EPE has designed and introduced Model No. 270-1 Collapsible Lead Flushcutter.

A cutting edge can be nicked, marred or broken when unthinking operators put heavy pressure on the handtool by trying to cut wire and leads too large or hard for the tool design. Model 270-1 Micro-Shear Flushcutter has a safety shear pin that snaps off when anyone tries to cut heavier than 14 AWG wire. A permanent top rivet holds the two-part steel handle together after a shearing. Replacing the broken shear pin with a new one quickly puts the handtool back in operation.

For more information contact James Bell, President, EPE Corporation, PO Box 5238, Manchester, NH 03108; (603) 669-9181. *Circle No. 137*

SOFTWARE

Machine Language Programs for PET

National Artificial Intelligence Laboratory has announced two new machine language programs for the PET 2001 Computer. SYS7171, which sells for $29.71 postpaid on cassette, is a machine language monitor which allows a PET user to program in machine language, or BASIC, without destruction of the monitor once it is loaded. Programs may be saved, loaded or rewritten while SYS7171 remains undisturbed. The user can skip from the SYS 7171 monitor to BASIC and then return freely. SYS7171 also allows the user to append one BASIC program to another. The user can have many subroutines on different cassettes, and, when desired, can append one or more of them to his program.

SYS8181 is a machine language renumbering program which requires only 1K of RAM. It sells for $18.71 postpaid. After SYS8181 is loaded, the user then loads a BASIC program and it will be completely renumbered in a matter of seconds. It begins with line number 100 and increments each line number by 10. SYS8181 also allows the user to select his own beginning line number and increment amount. Not only does SYS8181 renumber the line numbers, but it also correctly renumbers every jump embedded in the program, such as GOTO or GOSUB.

Both programs come with manuals. For more information contact National Artificial Intelligence Laboratory, Box F, Mobile, AL 36601; (205) 433-5529. *Circle No. 164*

Full-function APL from Harris

Harris Computer Systems has announced a full-function APL. Also offered is a specially-configured, fully-functional system providing users with mainframe APL performance at an entry-level price of less than $125,000, according to the company.

With the ability to support 4 APL users concurrently, the Harris S123 system includes 240,000 bytes of MOS memory, 1,536,000 bytes of virtual memory, floating point hardware, 40-Megabyte disk drive, 9-track magnetic tape unit, DMA communications processor with 4 asynchronous ports and a system CRT with keyboard and controller. As the need arises, the S123 can be expanded to 8 users and upgraded to as many as 32.

A shared variable implementation, Harris APL supports an extended file I/O system for data management and manipulation abilities outside APL workspaces. This mode permits the use of files for exchange of information between programs using other Harris standard languages such as FORTRAN, COBOL, RPG II and BASIC.

For more information contact Harris Computer Systems, 1200 Gateway Dr., Ft. Lauderdale, FL 33309; (305) 974-1700. *Circle No. 165*

Statistical Package

Research Resources Ltd. has announced a statistical package for SWTP compatible microsystems. The package, named SAM (Statistical Analysis for Microcomputers), requires a minimum configuration of 32K and a dual floppy disk (mini or standard). The current version contains edit, transformations, summary statistics, correlation matrix, partial correlation matrix, contingency tables, histogramming, scattergramming, regression, factor analysis, discriminant analysis, cluster analysis, anova and T-Tests.

For more information contact P.O. Box 160, Potters Bar, Herts., England. *Circle No. 166*

Two On-Screen Text Editors

TSA Software, Inc., has announced DAISY and WPDAISY, on-screen text editors that work on the normal video terminal already in your micro system. Just pop in the disk and you're ready to key in manuscripts or read them from existing disk-files, the company said. A set of simple commands allow you a full range of editing options.

DAISY allows you to add, delete or change the text by moving the cursor to the location of change, giving a command and typing in the change.

WPDAISY, the word processing version of this system, includes both space and proportional justification. WPDAISY allows you to call disk files while formatting. The system has 26 in-memory buffers and a mail merge program, useful in producing form letters and labels. For more information contact TSA Software, Inc., 39 Williams Drive, Monroe, CT 06468; (203) 261-7963. *Circle No. 167*

General Accounting Systems for Wang Computers

National Software Marketing Inc. has released four general accounting packages for Wang computers. The packages, including payroll, accounts receivable, accounts payable and general ledger, will operate on the WCS 20 or 30 systems. The systems are supplied on three floppy disks each. Each package is $200 plus a $10 handling and media fee. The software comes with a 30-day return privilege. For more information contact National Software Marketing Inc., 4701 McKinley St., Hollywood, FL 33021; (305) 961-4888. *Circle No. 168*

6800 Sort/Merge Package

TSC has announced a full-disk sort/merge package for the 6800 microprocessor. Written in 6800 assembly language, it is directly compatible with the standard 8-inch Flex disk operating system on SWTPC's DMAF-1 floppy disk system.

Any type and size file may be sorted. Parameters for the sort may be supplied in any of three ways: as part of the command line, through use of a "parameter editor" or by specifying an existing parameter file. Files too large to fit in memory are broken into multiple, temporary work files which are individually sorted and then merged into one. At the end of the merge process, all temporary work files are deleted. The final output file may be routed to disk, CRT terminal, or printer.

Included in the purchase price of $75 (order part no. AP68-10) is a user's manual and 8-inch Flex disk containing the object code. No source listing is included with this package. The manual may be purchased separately for $15. Contact Technical Systems Consultants, P.O. Box 2574, West Lafayette, IN 47906. *Circle No. 169*

Data Processing/Word Processing Enhancement

Basic Four Corporation announced a word processing enhancement to its top of the line computer systems. Called DataWord, it permits Basic Four System 610 or 730 users to do data processing and word processing concurrently using the same data base.

DataWord is an enhancement to two models in the firm's computer line, suitable for firms with annual sales of $25 million and less.

At incremental costs for terminals, FBC customers can use their DP system for word processing applications, the company said. In addition, the word processing function can take advantage of the DP data base – for example, use the name and address of a customer in the DP accounts receivable file to create a follow-up sales letter.

The DataWord enhancement can be added to new or existing Basic Four System 730 or 610 business computers. The System 730 can accommodate two text display terminals and up to six video display terminals for data processing, or one TDT and seven VDTs. The System 610 accommodates two TDTs and four VDTs or one TDT and seven VDTs.

Priced at $12,500, the minimum word processing components of the DataWord enhancement to the System 610 or 730 include one text display terminal, one word processing printer, memory, controllers and software.

For more information contact Basic Four Corp., P.O. Box C-11921, Santa Ana, CA 92711; (714) 731-5100. *Circle No. 170*

G/L Accounting Package Systems for Wang

A General Ledger accounting system for Wang computers is now available from Data Train, Inc. (DTI).

General Ledger 101 operates on Wang "T" and PCS II models with various disk units which are user-selectable through the G/L product. The 101 package is suitable for professional accountants and businesses. All necessary accounting reports and audit trail are included and the user may format the financial statements to meet internal or customer needs. Format control is provided for the Balance Sheet, Comparative Balance Sheet, P&L, Comparative P&L and Change in Financial Position. These reports may contain up to eight columns of data.

Special reports may be designed and obtained through the systems report writer feature. G/L 101 will process multi-divisional/departmental companies and provide appropriate reports. Also, if desired, the user may select the spread journal feature to summarize journal entries for posting and/or reporting.

Typical limits on a Wang dual Floppy configuration are 2000 monthly posted transactions with 500 General Ledger accounts; however, the disbursement is under user control. This software requires 8K to 16K memory and dual mini or floppy diskettes or hard-disk with a single floppy available.

DTI products are distributed in object code with operator's manuals. G/L 101 costs $850 from DTI, 840 NW 6th Street, Suite 3, Grants Pass, OR 97526; (503) 476-1467. *Circle No. 171*

Interactive Business Package

AMCAP, a complete interactive business software package developed by American Microprocessors, is being offered as a product line turnkey business software package by Ohio Scientific on their Challenger series microcomputer systems. The package includes General Ledger, Receivables, Payables, Inventory, Order Entry, Customer Files, Billing and Payroll. AMCAP is written in Microsoft BASIC.

AMCAP is also useful for accountants and CPA firms to enhance in-house manual methods and reduce outside service costs.

The package is available using a minimum system configuration of dual floppy disks, 48K of memory, keyboard display and printer. A maximum configuration consists of quad floppy disks, 48K of memory, keyboard display, printer and up to four 74-million byte Winchester technology hard disks.

For more information contact American Intelligent Machines Corp., The Chicagoland Airport, P.O. Box 48, Prairieview, IL 60069; (312) 634-0076. *Circle No. 149*

Mailing List Program

A general purpose mailing list program, developed for the Micropolis disk system (Mod II) is menu driven and contains seven modules for maximum space savings. Search time per name is greatly reduced due to KEY WORD storage files. There are three user defined variables and the program will sort by any of three different parameters. Two types of listings and a label generator are available.

This system requires a minimum of 32K bytes of memory and a single disk drive. For the maximum record size (1000 names and addresses), a 48K system will be required. An option of two sorts is offered with the program package. The standard version uses a BASIC Language sort routine (125 items = 120 seconds). The Machine Language Version uses a Machine Language sort routine (125 items = 3 seconds and 1000 items = 20 seconds). Included in both packages are a complete user's manual and the program disk. The standard sort mailing list package is $39.50 and the machine language sort mailing list package is listed at $79.50. For more information contact Rodger Pogue, Computer Services, P.O. Box 15643, San Diego, CA 92115; (714) 299-4228. *Circle No. 150*

Text Editor

EDIT-80, a random access, line oriented text editor for 8080 and Z80 systems, is available from Microsoft. The editor provides fast access to any record of a floppy disk file, even if the available memory space is considerably smaller than the file being edited.

In addition to the standard line commands to insert, delete, print or replace lines of text, EDIT-80 offers other features such as automatic line renumbering, global find and substitute, multiple-page files and ability to read in files without EDIT-80 line numbers. The editor's Alter Mode provides intraline subcommands to edit portions of individual lines. With EDIT-80, the edited file is not written to disk until a write command is given and the original file is always saved as a back-up.

The text editing package includes a file compare utility program called FILCOM which compares source or binary files and outputs differences between them.

EDIT-80 runs on any 8080 or Z80 system with the CP/M operating system. Package price is $120. For more information contact Paul Allen, Microsoft, 10800 NE Eighth, Suite 819, Bellevue, WA 98004; (206) 455-8080. *Circle No. 151*

6502 Video Driver Routine

Forethought Products has a new software package available for 6502 system users with memory mapped type video boards. The 6502 Video Driver Routine (VDR) provides complete software support for memory mapped video boards and is easily interfaced to applications programs, assemblers and BASIC. It manages cursor movement, line and page overflow, scrolling and control functions. Programmable mode control is maintained over the video board so that graphics, Greek and reverse characters can be displayed. The 6502 VDR also includes facilities for scrolling speed control, printer control and partitioning of the screen into protected areas.

The software is designed for S-100 video boards of 16 lines by 64 characters (such as Solid State Music VB1-B, Polymorphic Systems VTI, Kent-Moore Alpha-Video II and Jade VB1-B) and can be adapted to 32 character boards as well. The software is provided on a KIM compatible cassette tape and includes versions which reside at 0200 or DD00. Both versions are ROMable and occupy ½K of memory.

The 6502 VDR with 12 page manual and full source listing is available for $9.50. For further information contact Forethought Products, 87070 Dukhobar Rd., Eugene, OR 97402; (503) 485-8575. *Circle No. 152*

North Star Disk Game

Micro Business Systems has announced Micro Monopoly, a new software game for North Star disk systems. The game allots each player $1500, rolls dice and positions you on the different properties. You're allowed to buy, sell or put houses on your property. The program keeps track of purchases and sales, rent payments, fines and money awards and draws cards for you when you land on Chance or Community Chest.

The game is written in North Star BASIC. It's object code resides in 32K of memory and runs in about 36K of memory. Disk data files are used. Price is $25. For more information contact Micro Business Systems, P.O. Box 15995, Tampa, FL 33684; (813) 885-4107. *Circle No. 153*

TRS-80, Poly and Pet Software

Original, low cost software is now available for the TRS-80, POLY and PET microcomputers. Included in the package are WWIII Bomber, Lunar Lander 5 and Biorhythm. Requiring only 4K of memory, these programs come on cassette for $9.96. A complete catalog is free upon request. For more information contact Software Industries, 902 Pinecrest, Richardson, TX 75080; (512) 471-7656. *Circle No. 154*

Tax Return Preparation Programs

Taxpro software is designed for the professional tax preparer who has an 8080 microcomputer, North Star disk drive and printer. This package computes IRS 1040 and thirteen related schedules and forms with the "least tax" approach. Hardcopy prints in format on Form 1040 pages 1 and 2, and prints other forms on plain paper.

The related forms and schedules are: Schedules A, B, C, D, E, G, R & RP, SE, TC; Forms 2106, 2441, 4726. Included is a user's manual and set of data input worksheets. Taxpro retails for $1415.

Taxpak software allows hobbyists and home users to compute IRS 1040 and up to five related schedules. Display is on video-screen with dollar amounts listed in order by form line number. This second, updated and improved release of the original Taxpak retails for $39.95.

For more information contact Dicomp, Box 8272, Rowland Heights, CA 91748. *Circle No. 155*

Software for Computalker

Computalker Consultants, designers and developers of the Computalker CT-1 Speech Synthesizer, announced their new Software Package II. Designed to expand the range of applications of the Computalker CT-1 Speech Synthesizer board, Software Package II contains: CTEDIT, a new parameter editor; CSEDIT, an editor for the CSR1 input; CTEST, a CT-1 hardware diagnostic; PLAYDATA, to hear the data files; MEMVOICE, a vocal memory dumper; KEYPLAY, a subroutine to play letters/digits; and PIANO, a simple musical keyboard.

The package, written in 8080 assembly language, includes the source codes. It's priced at $30 and is available on C/PM 8-inch diskette, North Star, Micropolis, Tarbell, CUTS, CUTS for SOL, MITS ACR and paper tape.

For more information contact Computalker Consultants, 1730 21st St., Suite A, Santa Monica, CA 90404; (213) 392-5230. *Circle No. 156*

Bookkeeper Program

Bookkeeper, recently introduced by the MicroSource division of the Phoenix Group, is a new client writeup system for small to medium size accounting firms.

The program will make client writeups easier and faster, the company said. Financial reports can be tailored to answer a client's specific needs. Choice of spacing, underscoring, indentations, header descriptions and nine statement levels makes the system flexible.

Bookkeeper, written for accountants by a CPA, is easy to operate, according to the company. The reports available include general ledger, chart of accounts, financial statements and payroll reports. The software is designed to run on a Z-80/8080 microcomputer system using North Star DOS, a Soroc or Hazeltine terminal and a high speed dot matrix printer (LA 180 or Centronics 779). Bookkeeper is available through local computer stores. Contact MicroAge Wholesale, 1425 W. 12th Place, Tempe, AZ 85281. *Circle No. 157*

Software from Ohio Scientific

Ohio Scientific has introduced a new software package making their Challenger III Series compatible with three common computer languages, (Microsoft Extended-Disk BASIC, 1968 ANSI-standard FORTRAN and 1974 ANSI-standard COBOL). The new software, designated OS-CP/M, is a complete 48K RAM implementation of Digital Research's popular CP/M operating system. Ohio Scientific's CP/M utilizes the Z-80 microprocessor, one of the three featured in every Challenger III Series computer system. The other two microprocessors are the 6502A and 6800.

OS-CP/M consists of a CP/M Text Editor, 8080 Assembler, Dynamic Debugger, Microsoft 8080 Macro Assembler, Dynamic Debugger, Microsoft 8080 Macro Assembler and Extended-Disk BASIC, FORTRAN and COBOL. Documentation includes reprinted and annotated CP/M and Microsoft manuals plus Ohio Scientific's introduction and overview. The software package also includes three 8-inch floppy diskettes. One diskette is for FORTRAN and BASIC, one for COBOL and one duplicator. Suggested retail price for OS-CP/M is $600. The new OS-CP/M software makes it relatively inexpensive and easy to upgrade an existing Model C3-S1, C3-A, C3-B or C3-OEM Ohio Scientific computer system, the company said.

For further information contact Ohio Scientific, Inc., 1333 S. Chillicothe Road, Aurora, OH 44202; (216) 562-3101. *Circle No. 177*

ASI Software CP/M Compatible

Administrative Systems, Inc. has made available its single-user system software, OPUS/TWO, S.O.S. and FORTE, on CP/M-compatible diskettes. This new format will allow users with a 32K (minimum) CP/M-based system to load and execute immediately ASI's system software packages.

Each package is structured as a CP/M-compatible file, which, when loaded, will execute, using the device drivers already existing under CP/M. Other files include a System Generation Routine, which will allow the user to create an ASI standard system diskette with customized device drivers and a Format routine used to set up data diskettes.

The new packages are available at standard cost and include users' manuals. Manuals may also be purchased separately. Their cost may be credited toward the cost of the appropriate software. Software is supplied on soft-sectored IBM-3740 (eight-inch) compatible diskettes, single density.

For more information contact Administrative Systems, Inc., 1642 South Parker Road, Suite 300, Denver, CO 80231; (303) 755-9694. *Circle No. 178*

BASIC Program Listings

Creative Computer Consultants Inc. has announced the Standard Software Library, a series of books containing listings of programs written in BASIC with complete documentation.

Each volume in the series is devoted to a single application. The first three volumes deal with Accounting Programs for Small Computers. Volume I, General Ledger, enables a small business to set up a fully automated General Ledger System with a complete Chart of Accounts. Included are programs for editing, sorting, merging and posting of transactions. A trial Balance report is available in either summary or detail at the users option. Income Statement and Balance Sheet reports may be obtained at the close of each accounting period with both current and year-to-date totals and percentages. Volume 2, Accounts Receivable, provides a fully automated system for dealing with customer accounts. Volume 3, Payroll, enables a business to automate all of the normal payroll functions.

All of the programs are written in a level of BASIC common to many current microprocessors and minicomputers. Each user can use the programs "as is" with a minimal effort. At the same time, the modular nature of the programs and the accompanying documentation make it easy to revise the program to meet special user requirements.

Documentation includes an overall view of the program, a list of the variables used, a description of the required user inputs and an illustrative example with sample output reports. Annotated comments are contained in all of the programs.

Future volumes in the series include EDMASTER, a volume devoted to administrative applications in education and STATMASTER which deals with all phases of statistics. For more information contact Creative Computer Consultants Inc., P.O. Box 2111, Norwalk, CT 06852; (203) 847-0141. *Circle No. 101*

IMSAI FORTRAN Compiler

IMSAI manufacturing Corporation has introduced FORTRAN IV Version 3.05, a compiler with a linking loader, an extensive subroutine library and facilities for generating and managing relocatable object modules. The FORTRAN compiler processes several hundred statements per minute in a single pass and needs less than 24K bytes of memory to compile most programs.

Among the compiler enhancements are true random disk file access, transfer of control at end of file or error condition, mixed mode arithmetic, hexadecimal constants, LOGICAL variables which can be used on integer quantities, LOGICAL DO loops and sixteen-digit, double-precision arithmetic.

IMSAI'S FORTRAN IV generates relocatable code, enabling the user to write and test programs in modules. If the user changes only one module of a program, only that module need be recompiled. A compatible assembler and linking loader allow the user to link FORTRAN and/or Assembler modules. Only the subroutines and system routines required to run a specific FORTRAN program are loaded before execution. The linking loader allows the user to separate program space, local data space and common data space and to specify where these elements go. Once loaded, the machine language image can be saved so the program can later execute directly.

IMSAI FORTRAN IV also utilizes the library concept. Routines implementing standard FORTRAN functions are included in an extensive subroutine library. In addition, the library provides routine of particular value for microcomputer users, such as direct

access to memory locations and I/O ports. The user may place additional subroutines in the library and create other subroutine libraries. For further Information Contact IMSAI Manufacturing Corp., 14860 Wicks Boulevard, San Leandro, CA 94577; (415) 483-2093. *Circle No. 102*

New Company Offers Super-Sort and Video Text Editing

MicroPro International Corporation, a computer software company newly formed from a former IMSAI management team, has announced its first offerings for microcomputer users: Super-Sort and Word-Master, a video text editor.

Super-Sort features include multi-level sort/merge (32-keys) with intermixed sequence indicators: data types and collating sequences (binary, BCD packed decimal, ASCII, EBCDIC, numeric string, etc.); invokable user exits which may be written in COBOL, FORTRAN IV and Assembler; variable length records; fixed length records; variable length fields (delimited by commas); fixed length fields (defined by column number); and user-defined optimization parameters. Select and Exclude directives allow user-specification of source file extraction criteria. Directive input to Super-Sort may be conversational or file-derived. Super-Sort may be invoked as a stand-alone program or called as a subroutine from Assembler, FORTRAN, COBOL or BASIC. Special support for numeric strings allows BASIC users to build files without PRINT USING thereby saving disk storage and improving performance. Special support for binary and BCD packed decimal data provides similar disk storage savings combined with improved applications performance for FORTRAN and COBOL users.

Word-Master provides extensive facilities for text editing based upon dumb CRT terminals. In the video edit mode, Word-Master features control key commands which allow bidirectional word tab, line tab and screen tab, left/right word delete and line delete, character/line insert/delete including midline line insert. Additional control key commands provide quadirectional cursor movement and file paging by line or by screen in either direction. High-speed operation is ensured by keystroke buffering and memory buffering of the floppy disk file being edited. In the command mode, Word-Master can perform group character-string searches and/or substitutions, merge several floppy diskfiles into the edited file, output edited text sections to additional files on diskette, and move text sections via a queue buffer to new or replicated sections. Looping and conditional matching round out the command set available to the user. Word-Master supports any conventional minimum-type CRT or video board with cursor addressing and clear-screen sequence. Word-Master

facilities are particularly suited to high-speed typing and editing applications especially where some pre-canned (i.e., boilerplate) text is to be used such as in proposals and legal documents.

For more information contact MicroPro International Corporation, 5810 Commerce Blvd., Rohnert Park, CA 95903; (707) 544-2865.
Circle No. 160

P.C.BOARDS

Intel's New iSBC 86/12 Supports 1-Megabyte Address Space

Intel Corporation is marketing a new Multibus compatible member of its single board computer product line; the iSBC 86/12 Single Board Computer. Based on the 16-bit HMOS 8086, (Intel's latest, most powerful microprocessor) the new computer board supports a one-megabyte address space.

Both 8-bit and 16-bit single board computers can now be interfaced over the same bus, says the company. Intel's Multibus, allows such multiprocessing configurations. In this manner, a designer can create low-cost designs using an 8-bit single board computer. He can then enhance it over time as application requirements grow, while minimizing design changes.

To meet application needs, a designer using this system can also replace an 8-bit board with a 16-bit iSBC 86/12 system. Alternately, an iSBC 86/12 can be used in combination with iSBC-80 boards, producing a mixed 8- and 16-bit multiprocessing system. Because iSBC 80 software is easily transportable to the iSBC 86/12 Board, and because the i-SBC 80 and 86 boards are bus- and form-factor compatible, previous 8-bit design investments may be protected while significantly enhancing systems performance.

An iSBC 957 Interface and Execution package is being introduced with the iSBC 86/12 Board. The iSBC 957 package permits software modules to be down-loaded into the iSBC 86/12 Board for full speed execution and debug. This, says the company, enables a designer to begin system development immediately with the iSBC 86/12 Board, using the same software development system offered for the iSBC 80 products.

The Multibus system bus structure has been expanded to support 20 bits of address and 16 bits of data. Control lines are also included to allow both 8- and 16-bit data transfers. With these extensions, the iSBC 86/12 Board can access data in byte and word quantities and directly address a full megabyte of System memory.

Because the 8- and 16-bit boards are form factor and bus compatible, they can interface with the same memory and I/O expansion boards.

The 16-bit HMOS 8086 microprocessor used in the system provides central processing power for the iSBC 86/12 Board. Operating at a clock rate of 5 MHz, the 8086 can execute a full set of Intel 8080A/8085A type 8-bit instructions in addition to a new set of 16-bit instructions. The 8086 extends 8-bit processor capabilities with features that include 8- and 16-bit arithmetic; interruptible byte string operations; and efficient bit manipulation. Mechanisms for handling reentrant code, and relocatable programs have also been provided on the 8086.

Memory capacity in the iSBC 86/12 includes 32K bytes of dual port dynamic read/write memory with on-board refresh and sockets for up to 16K bytes of ROM.

Memory can be reserved in 8K-byte segments up to 32K bytes for exclusive use by the CPU. This capability allows multiprocessor systems to establish local memory for each processor and shared memory configurations where the total system memory size can potentially exceed one megabyte. Four sockets are provided on the iSBC 86/12 Board for accommodating up to 16K bytes of nonvolatile ROM. Increments may be added in 2K-byte quantities to a maximum of 4K bytes by using Intel 2758 EPROMs; in 4K-byte increments up to 8K bytes. System memory size is easily expanded by the addition of Multibus compatible memory board.

A Universal Synchronous/Asynchronous Receiver/Trasmitter (USART) is included on-board for serial communications capability. All standard baud rates can be accommodated by the programmable baud rate generator. Data format, operation mode (i.e., synchronous or asynchronous), control character format and parity are all under program control.

The USART provides a full duplex, double buffered transmit and receive capability. Parity, overrun and framing error detection are also incorporated in the USART. A full RS232C interface working in conjunction with the USART allows the iSBC 86/12 Board to communicate with other computers and with such RS232C compatible peripherals as CRTs and cassette tape drives.

The development cycle of iSBC 86/12 Board and 8086-based products can be significantly reduced by using the Intellec series Microcomputer Development Systems. Using the Intellec systems, software can be developed for the iSBC 86/12 Board using ASM-86 assembly language or Intel's high-level language PL/M-86.

To facilitate program development with the Intellec system, the iSBC 957 package provides all the necessary hardware, software cables and documentation required to interface the Intellec system to the iSBC 86/12 Board. Software generated on the Intellec system can then be down-loaded into the iSBC 86/12 Board for full speed execution and debug.

To provide the most effective use of the iSBC 957 package, the execution environment should include an iSBC 86/12 Single Board Computer, an iSBC 660 System Chassis for power and system expansion, and one or more iSBC 032, 048 or 064 RAM boards for programs requiring more than 32K bytes of RAM. With this execution vehicle, designers can execute and debug programs ranging from 324 to almost one-half a megabyte. Additional iSBC boards or custom designed boards may be added to the configuration to further extend system development capabilities.

Both the iSBC 86/12 Single Board Computer and the iSBC 957 Interface and Execution package can be ordered from Intel. The iSBC 86/12 Board is priced $2140, the iSBC 957 Package at $2145. For more information contact Intel Corporation, 3065 Bowers

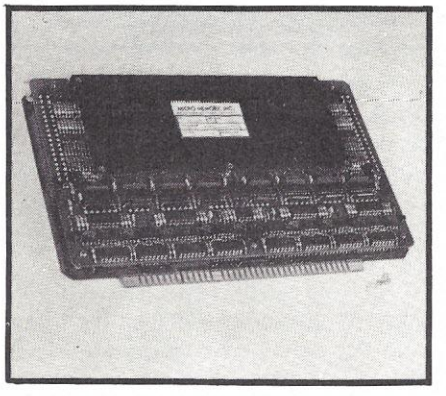
Avenue, Santa Clara, CA 95051; (408) 249-8027. *Circle No. 158*

Non-Volatile Memory

Designed specifically for non-volatile operation with Motorola EXORcisor and MEC 6800 evaluation module is Micro Memory, Inc.'s new MM-6800/16, a 16K x 8 core memory system. The memory module has internal power monitoring circuits to protect data from power failure or during turn-on/off conditions. No battery back-up or special circuits are required for power supply sequencing. An automatic power-on reset signal is provided as a function of the + 5 V and + 12 V supplies.

The MM-6800/16 allows users to fulfill the function of both RAM and PROM on the same unit. A switch is provided whereby users may write-protect portions of the memory in 2K increments up to a maximum of 16K. On board module selection is provided in 4K increments up to 64K words of memory.

The memory is a single package plug-in module, containing two printed circuit boards and having outline dimensions of 5.75" x 9.75" x 0.85". Unit pricing is $849. Delivery is 4 weeks.



For more information contact Micro Memory, Inc., 9438 Irondale Avenue, Chatsworth, CA 91311; (213) 998-0070. *Circle No. 159*

SSM's New Video and CPU Boards

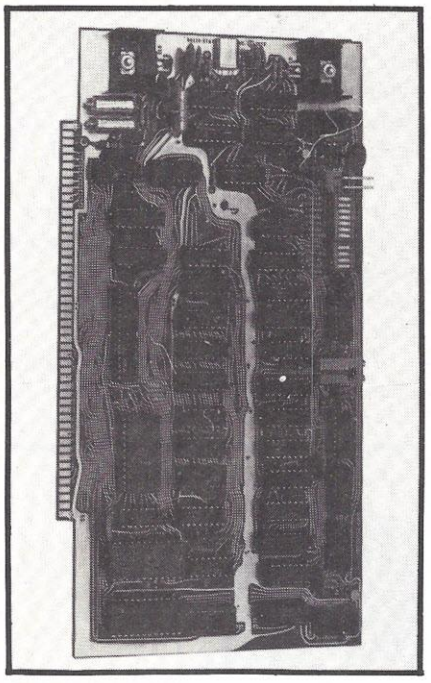
SSM (formerly Solid State Music) has introduced the VB2, an I/O controlled video interface board. The VB2 has its own keyboard input port, so there is no need for another I/O board for either keyboard or video display. The hardware controller cursor for line feed, carriage return, backspace and clear-screen frees up valuable memory space.

The display is 64 x 16, all upper case letters as well as numbers and symbols, and is switch selectable for white-on-black or black-on-white. Character width, horizontal margin and vertical position are adjustable. The board features full interface for complete compatibility with U.S. TV video standards. Circuitry is provided to drive an external speaker for "beep" tone.

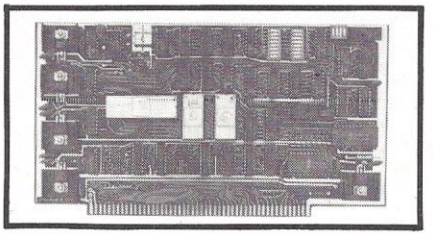
The VB2 has gold-plated edge contacts, plated-through holes, TI low-

profile sockets and factory prime parts. The PC board is made of FR-4 blue epoxy and is solder masked for ease of assembly. The VB2 is available in kit or assembled form. The kit is priced at $149.95.

SSM's second new product is its CB1 8080 CPU board for S-100 bus computers. The CB1 contains enough RAM, EPROM and other features to allow a 2 board computer. All that is needed is an I/O or video board.



The CB1 has 256 bytes of on-board RAM for scratch memory that can be DIP switch addressed to any 256 byte boundary. Sockets are provided for 2K of 2708 EPROMs for a monitor program, small operating system, industrial control software or other functions. The EPROMs are DIP switch addressable to any 2K boundary.



For operation without a front panel, the CB1 can vector jump to the beginning address of the on-board EPROM on power-up or reset. And the board can generate an MWRITE signal. The jump circuit and MWRITE signal can be disabled if necessary.

An 8 bit parallel input port with separate status is provided on the CB1, with DIP switch addressing up to 31 decimal. The input port can also be used for a keyboard or for up to 8 sensing lines for home or industrial control application.

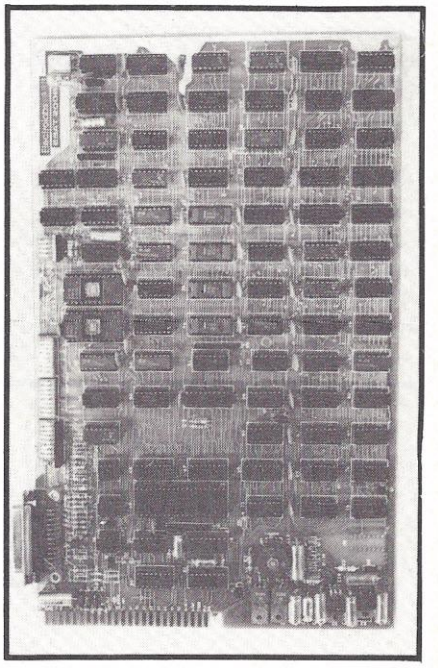
Both new SSM boards have gold-plated edge contacts, plated-through holes, TI low-profile sockets and factory prime parts. The PC boards are made of FR-4 blue epoxy and are solder masked for ease of assembly.

The CB1 board is available in kit or assembled form. The kit is priced at $144.95. For further information contact SSM, 2116 Walsh Ave., Santa Clara, CA 95050. *Circle No. 138*

Single Board Terminal

A new Single Board 80X24 Terminal has been announced by Electrolabs. This standard interface terminal is the ESAT 200B and features user alterable EPROM to contain two fonts of up to 128 characters each. The ESAT 200B also features split serial data transmission and reception, RS232C, 20 mA loop and TTL interface levels and a copyrighted design with a low package count.

The user alterable fonts are programmed into 256 7 X 8 cells which are displayed contiguously. This allows the rendition of extended characters in two or more adjacent cells. Electrolabs



emphasizes the versatility and generality of this approach: anything may be programmed into these characters and limited graphics. If the user has no EPROM programmer, he may simply

pencil in the spaces in a printed grid, return it and a check for $50 to Electrolabs. Electrolabs will send him a new EPROM 2708 programmed to display the contents of his character cells exactly as he has drawn them.

The ESAT 200B is delivered with a 2708 containing full upper and lower case ASCII and one empty socket where a second EPROM may be simply plugged in. In all cases, the second font is addressed using the 8th data bit, or the 'Meta' key as it is called in some systems. The ESAT 200B also presents the usual features of a terminal such as addressable, non-destructive cursor, page transmit, and 15 Watts power consumption.

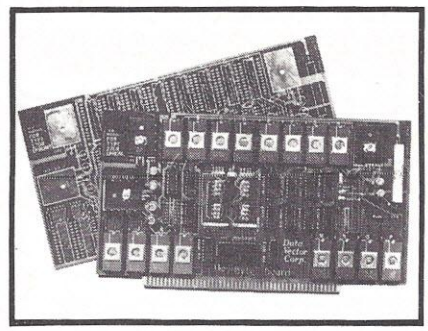
Keyboard input is 7 or 8 bits with negative strobe, and video output is selectable RS 170 composite video, or separate horizontal and vertical drive. Designed for the OEM who needs less turnaround time and greater flexibility in his terminal package design, the ESAT 200B Stand-Alone Terminal Electronics Board is priced at $329 for quantity one. Larger quantity discounts are available. Because of the standard, simple interfacing and low price, the ESAT 200B is suitable for the home user who needs a full feature terminal which is not an integral part of his CPU.

For more information contact Electrolabs, P.O. Box 6721, Stamford, CT 94305; (415) 321-5601. *Circle No. 172*

A New Byte Board with 16 EPROM Capacity

Data Vector Corporation has announced the "Byte Board" module for the S-100 bus. The unit accepts up to sixteen 2708 EPROMs, incorporates a Power-On Jump capability, provides for wait-state generation for slow memories and possesses extreme addressing flexibility.

Each EPROM is individually addressable on any 1K boundary, and may be placed anywhere in the computer's address space. Unused EPROM locations do not take up memory address space. Additionally, all user selectable options are silk-screened onto the board, allowing the state of all options (including the address assigned to each EPROM), to be read directly from the board without referring to the manual.



The module, solder masked to minimize solder bridges during assembly, is fully socketed, has two spare IC pads for custom circuitry. A 20 page

owner's manual is supplied with each unit.

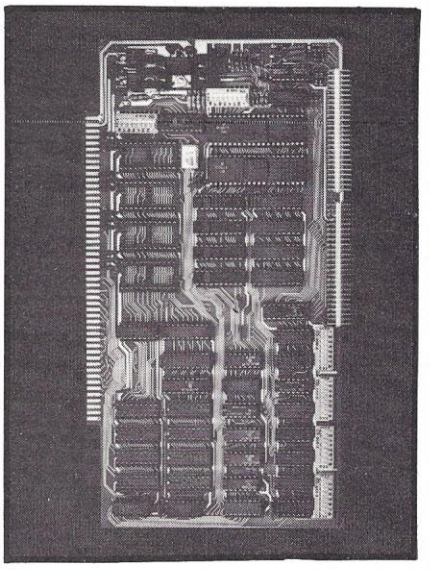
The Byte Board, without EPROMs, assembled and tested, is $99. The kit form costs $69. Fully loaded with 16 EPROMs, the module is $243 assembled or $213 in kit form. EPROMs may be purchased separately. For more information contact Data Vector Corp., P.O. Box 3141, Burbank, CA 91504. *Circle No. 161*

A new Switchboard and SuperRam Board from Thinker Toys

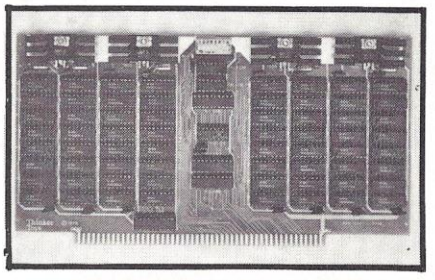
Thinker Toys' I/O boards for S-100 system, the Switchboard, has four parallel ports, two RS232/TTY serial ports plus strobe and attention ports. In addition, there are options for 4K of RAM and 4K of EROM.

Every port is switch-programmable for flexibility in interfacing various types of peripherals. Each parallel port can be switched for input or latched output. Both serial ports can be switched to any of sixteen baud rates from 110 to 19K. Each strobe and attention port flip-flop can be switched for positive or negative pulsing. The eight I/O addresses of the Switchboard can be located on any boundary divisible by eight. Price is $199 kit and $259 assembled retail.

The SuperRam 32K static RAM board uses the National's 5257 or TI's equivalent 4044 4Kx1 NMOS memory



chips. It runs at 2 MHz for standard 8080 systems or 4 MHz for Z-80 systems. A phantom option is provided for CPUs using this line. All control



signals, addresses and data lines are fully buffered. Each 16K block is independently addressable and write protected. The board contains only seven support ICs and the typical power consumption is 2.6 amps.

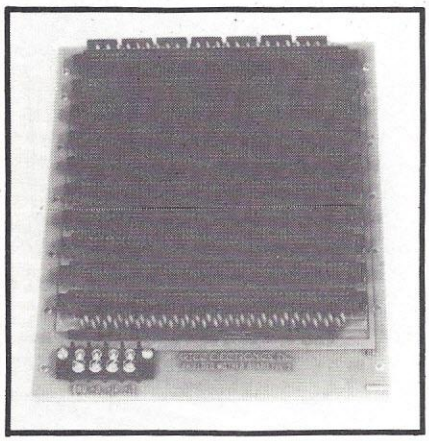
Pricing: $649 kit; $699 assembled. Further information can be obtained from Thinker Toys, 1201 10th St., Berkeley, CA 94710; (415) 524-2101. *Circle No. 162*

A New 10-Slot Version of its 16-Slot Motherboard from Artec

Artec Electronics, Inc., has introduced a ten-slot version of its 16-slot, silent, totally shielded motherboard. Intended for use in compact systems with large memories, the ten-slot configuration allows processor and peripherals to be condensed into a smaller package, without large amounts of spurious noise in the bus lines.

The board features the same, one-eighth-inch FR4 glass epoxy construction and substantial ground traces as the 16-slot model. It also features Artec's PRC termination technique, which terminates each S-100 bus line in an optimum impedance without increasing the zero-state leading of the bus drivers. This technique, says Artec, eliminates the ringing commonly found on a bus, but does not limit the "number" of boards that can be placed on the bus.

The ten-slot board, which measures 8" x 9.80", features "Masterite" connectors. It comes drilled to mount in the Imsai chassis and can be drilled to fit other chassis.



The ten-slot shielded motherboard is priced at $115, assembled and tested, in single quantities. For more information, contact Robert Jones, Artec, 605 Old County Road, San Carlos, CA 94070; (415) 592-2740. *Circle No. 163*

MD-690A CPU Board

MDS announces the MD-690A, a new CPU board which adds 6809 compatibility, 10K PROM and RS-232 interface provision to MD-690.

MD-690A gives the user more monitor flexibility and the option of upgrading the board to accommodate the upcoming 6809 processor chip by Motorola. This processor has internal 16-bit arithmetic, 8 x 8 multiplication, 18 addressing modes (the 6800 has 6) and 5 times the throughput of the 6800 (making it 3 times faster than a 4 MHz Z-80).

MD-690A comes complete with Monbug, a 1K PROM monitor program which is software compatible with the standard Motorola Mikbug monitor; however, it interfaces with most memory-mapped video and graphic cards for ultra-fast I/O. The board can accommodate up to 10K of 2716 EPROM which may be used for 8K BASIC or other firmware. An expanded monitor, Monbug II, will soon be available, offering all Monbug features plus a 1K text editor.

The processor card also features an

on-card 2400 baud Manchester cassette interface, interrupt driven keyboard input for fast I/O and provision for an RS-232 interface. It provides the user with 16 I/O ports and DMA capability. The board is high quality, double-sided, plated through, solder masked and silk screened.

The S-100 bus/MC6802/09 CPU board, complete with the 2400 baud cassette interface, 1K monitor and 1K RAM costs $198 in kit form, $258 assembled and tested. Complete documentation including assembly and trouble-shooting instructions and a comprehensive user's guide are provided.

The CPU is also available in a complete system, the MDS-2, which includes a hand-finished redwood case, power supply, motherboard, video/graphics card and custom keyboard, for $569 in kit form, $749 assembled.

To complement the MD-690A CPU, MDS offers software which mates the video/graphics capability with the flexibility and speed of the 6802. Planned software includes a 10K graphics-oriented BASIC, PASCAL, game programs such as Spacewar and Chess, business oriented programs, medical data base programs, programs for household management, student software and many others.

For more information contact MDS, Micro Data Systems, P.O. Box 36051, Los Angeles, CA 90036 (213) 939-6764. *Circle No. 141*

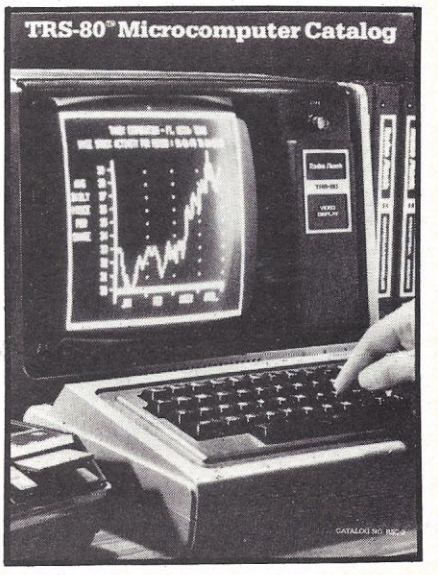
LITERATURE

New Catolog for TRS-80

A new 20-page, full-color TRS-80 Microcomputer Catalog has been issued by Radio Shack. The catalog includes current information on the TRS-80 microcomputer, its peripherals and accessories with plain-language descriptions, application ideas and detailed specifications, according to the company.

A general section in the catalog explains what a computer is, what it can do and who can use the TRS-80.

The catalog describes the TRS-80 system, Level I and Level II BASIC Languages and the peripheral equipment available for use with the TRS-80, including its expansion interface, mini-disk system, printers, interfaces, manuals and new TRS-80 system desk.



TRS-80 Microcomputer Catalog #RSC-2 is available free on request from Radio Shack stores and dealers nationwide. For more information contact Tandy Corp., One Tandy center, Fort Worth, TX 76102; (817) 390-3272. *Circle No. 142*

Wang Twin Sheet Feeder

A product information flyer on a Twin Sheet Feeder is offered by Wang Laboratories, Inc. With any Wang word processing system, the Twin Sheet Feeder automatically supplies legal or letter-size paper to the printer. It provides front and remaining pages from its two feeder trays, and collates and sequentially stacks completed documents in the receiving bin. The feeder reduces operator intervention during printing and eliminates the need for continuous form stationery. For more information contact Wang Laboratories, Inc., One Industrial Avenue, Lowell, MA 01851; (617) 851-4111. *Circle No. 143*

Control Software Brochure

Wyle's PCB (Process Control BASIC) is described in a new four-page brochure. Laid out in a "what, why and how" format, the brochure covers PCB programming, functions and statements, and the many process I/O subroutines available. The brochure,

like PCB itself, is geared toward the engineer who knows his process and wants a system tailored exactly to his needs, Wyle said. For a copy of the brochure or additional information contact Wyle Laboratories/Computer Products, 3200 Magruder Boulevard, Hampton, VA 23666; *Circle No. 144*

Free Paperback

Information about home computers is offered free from NCE/CompuMart, Inc. *Getting Started with Microcomputers* evaluates 25 books and periodicals on current technology and equipment and recommends each for its usefulness to the programmer, engineer or systems designer.

This illustrated paperback also includes an up-to-date buyer's guide with current prices and capabilities of today's home computers. To receive your free copy, write to NCE/CompuMart, Inc., P.O. Box 8610, Ann Arbor, MI 48107. *Circle No. 145*

Users' Group and Newsletter

Compucolor Corporation, manufacturer of the Compucolor II, recently announced formation of a users' group and a corresponding newsletter. The users' group will serve as a forum where users and owners can exchange computer programs, inspirations and ideas. Software contributions may be accepted by Compucolor Corporation on a sale or trade basis, and users can trade for other programs.

The newsletter, "ColorCue", published monthly, contains features for experienced programmers as well as beginners.

The Compucolor II, available in three models, is a stand-alone microcomputer intended for home use. It has its own 13" screen with an eight-color display and a typewriter-like keyboard. The units have 8K to 32K of user memory (depending on the model), and all the machines have an Extended BASIC language in ROM with graphics capabilities. Prices start at $1495.

For further information contact Joy Baker, Compucolor Corporation, P.O. Box 569, Norcross, GA 30071; (404) 449-5879. *Circle No. 146*

Shasta Dual Function Computer System

Word processing and data processing functions often performed by two separate systems are now combined in a single computer system – the Shasta Daisy from Shasta General Systems. The Daisy is an administrative computer system, equipped with video display screens, large and small disk and diskette drives and high-quality printers. Literature describing this system for dual word/data processing is available from Shasta General Systems, Marketing Division, 895 Stanton Road, Burlingame, CA 94010. *Circle No. 147*

Speech Lab Application Note

Heuristics, Inc., offers an application note for its Model 20 series speech (word) recognition subsystems used with Apple II and S-100 computers. The note describes how to swap, save and restore vocabularies so the units can recognize multiples of 32 words, providing a large vocabulary size. Another reason to save data is to eliminate the need to "train" the unit with the proper vocabulary each time the SpeechLab is used.

For further information, contact Heuristics, Inc., 900 N. San Antonia Road, Los Altos, CA 94022; (415) 948-2542. *Circle No. 148*

SALES OFFICES

Northeast: George Palken, 1050 Commonwealth Ave., Boston, MA 02215; (617) 232-5470 • **Mid-Atlantic**: Arthur Daks, Arlene Joseph, 92 So. Central Ave., Valley Stream, NY 11580; (516) 872-9550 • **Los Angeles**: Carol Stagg, 924 Westwood Blvd., Suite 610, Los Angeles, CA 90024; (213) 478-3017 • **San Francisco**: Ralph Peterson, 1180 Oak Creek Dr., Palo Alto, CA 94304; (415) 328-4392 • **Japan**: Hiro H. Irie, International Business Corp., 11-8, Narita-Higashi 1-chome, Suginami-ku, Tokyo 166; Phone: (03) 311-1746 • Exposition Service Sales Office: Louise Garcia, (505) 897-1971.

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For further information, contact:
Professor Howard A. Peelle, Director, Instructional Applications of Computers, School of Education, University of Massachusetts, Amherst, Massachusetts 01002, (413) 545-0496-0246 (messages)

How to write for Personal Computing

You've written the programs we want to publish. You – the *Personal Computing* readers – are using your computers in businesses, homes, offices and schools. Other readers, just as software-hungry as you, are eager to try out your programs, your applications and your techniques. So why not share what you've done by submitting an article to *PC?*

It's easier than you might think. Remember: we're more interested in practical programs and useful applications than in fancy prose. And our editorial staff stands ready to help with any problems you encounter in writing your article; just give us a call at (617) 232-5470.

Here are some handy guidelines to help you get you started.

First, decide what kind of article you want to write. Do you have a *business program* that will help an executive, salesman, doctor, lawyer or shopkeeper function more efficiently? Think about how businesses can benefit from microcomputers – not only in the obvious areas of inventory, accounting and payroll, but in all departments and levels right up to the president's desk. Financial and marketing analysis, time management, planning, material handling, product design and cost accounting are areas ripe for creative programming.

How do you use your computer for *home and personal applications* in your living room, kitchen, study or den? Again, think beyond the obvious areas of checkbook balancing and budgeting (though these areas are far from exhausted) to other applications. Hobbies, home management, house-hold inventory, gardening and landscaping, personal income and expense analysis, personal mailing lists and work processing are just a few ideas to spark your imagination.

What *education programs* have you written for children, adults, professionals, businessmen and teachers? Computers can not only teach children basic subjects such as spelling, math, geography, economics, civics, grammar, literature and science, but can help adults review or sharpen skills in these areas as well. How else can computers function in or out of the classroom to aid learning? To help teachers and administrators?

Are you proficient in some programming technique or special computer area you could explain in a *tutorial article*? How do you save time, money, computer memory or frustration when programming or using your computer? Others can benefit from the same techniques you use.

Computer games, history, humor and fiction are other areas rich in article and story ideas.

Your second step is to write the text of the article. Remember, readers aren't familiar with your program. So explain in detail what the program does and how it does it. Include here the overall structure of your program as well as any special algorithms or routines you've used. Give suggestions for modifying or expanding the program for other applications, other businesses or other situations.

Third, prepare your supporting documentation. Include at least a program listing and one or two sample runs, and add program notes to explain any special commands used or other special features of your program. Use charts, diagrams, figures and photos if they help explain your program and its use.

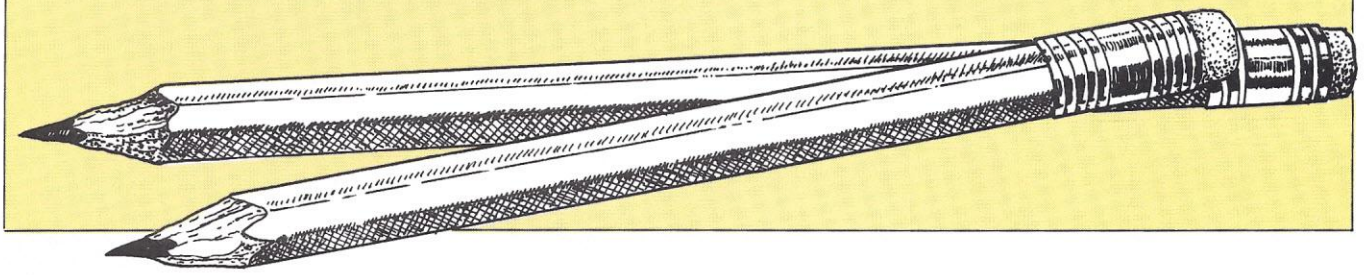
Finally, mail your manuscript. Address it to Editor, Personal Computing Magazine, 1050 Commonwealth Ave., Boston, MA 02215.

A few suggestions: All submissions should be original, typed (*not* all CAPS), double-spaced and neat. Please include your name and address on the first page of the article and enclose a self-addressed, stamped envelope for return of material.

Since we photograph program listings and sample runs exactly as you send them to us for publication in the magazine, please be sure you use a fresh ribbon for computer printouts. If you don't have a printer, you can type your listings single spaced; but again, be sure you use a new ribbon. (If your program relies heavily on graphics, you can photograph sample runs from your CRT. But take care to avoid distortion due to the curve of the screen.)

Feel free to call us if you have any questions or want to discuss specific ideas. We can give you feedback and suggest appropriate slants and approaches.

We're always looking for fresh, original ideas. While these guidelines will help you in preparing material for *Personal Computing*, don't assume we don't want your idea just because it's not mentioned here. Let us and our readers know what *you're* doing with your computer.



Color. VP-590 add-on Color Board allows program control of 8 brilliant colors for graphics, color games. Plus 4 selectable background colors. Includes sockets for 2 auxiliary keypads (VP-580). $69.*

Sound. VP-595 Simple Sound Board provides 256 tone frequencies. Great for supplementing graphics with sound effects or music. Set tone and duration with easy instructions. $24.*

Music. VP-550 Super Sound Board turns your VIP into a music synthesizer. 2 sound channels. Program control of frequency, time and amplitude envelope (voice) independently in each channel. Program directly from sheet music! Sync provision for controlling multiple VIPs, multitrack recording or other synthesizers. $49.*

Memory. VP-570 RAM Expansion Board adds 4K bytes of memory. Jumper locates RAM in any 4K block of up to 32K of memory. On-board memory protect switch. $95.*

EPROM Programmer. VP-565 EPROM Programmer Board comes complete with software to program, copy and verify 5-volt 2716 EPROMs—comparable to units costing much more than the VP-565 and VIP put together! Programming voltages generated on board. ZIF PROM socket included. $99.*

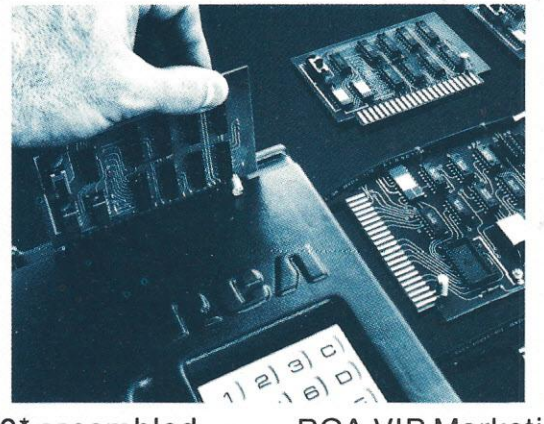
EPROM Interface. VP-560 EPROM Interface Board locates two 5-volt 2716 EPROMs (4K bytes total) anywhere in 32K of memory. VIP RAM can be re-allocated. $34.*

ASCII Keyboard.** Fully encoded, 128-character ASCII encoded alpha-numeric keyboard. 58 light touch keys including 2 user defined keys! Selectable upper and lower case. Handsomely styled. Under $50.*

Tiny BASIC.** VP-700 Expanded Tiny BASIC Board puts this high-level language on your VIP. BASIC stored in 4K of ROM. Ready for immediate use—no loading necessary. This expanded BASIC includes the standard Tiny BASIC commands plus 12 additional—including color and sound control! Requires external ASCII encoded alpha-numeric keyboard. $39.*

Auxiliary Keypads. Program your VIP for 2-player interaction games! 16-key keypad VP-580 with cable ($15*) connects to sockets provided on VP-590 Color Board or VP 585 Keyboard Interface Card ($10*).

COSMAC VIP lets you add computer power a board at a time.



With these new easy-to-buy options, the versatile RCA COSMAC VIP (CDP18S711) means even more excitement. More challenges in graphics, games and control functions. For everyone, from youngster to serious hobbyist. And the basic VIP computer system starts at just $249* assembled and ready to operate.

Simple but powerful—not just a toy.

Built around an RCA COSMAC microprocessor, the VIP includes 2K of RAM. ROM monitor. Audio tone with a built-in speaker. Plus 8-bit input and 8-bit output port to interface relays, sensors or other peripherals. It's easy to program and operate. Powerful CHIP-8 interpretive language gets you into programming the first evening. Complete documentation provided.

Take the first step now.

Check your local computer store or electronics parts house. Or contact RCA VIP Marketing, New Holland Avenue, Lancaster, PA 17604. Phone (717) 291-5848.

*Suggested retail price. CDP18S711 does not include video monitor or cassette recorder.
**Available 1st Quarter, 1979.

The fun way into computers.

RCA

CIRCLE 2